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Volume 2, No. 2. Circulation of this issue—31,614

The Beaver "71 Series"... a fully-adjustable threader for pipe, bolts, pump rods, etc.

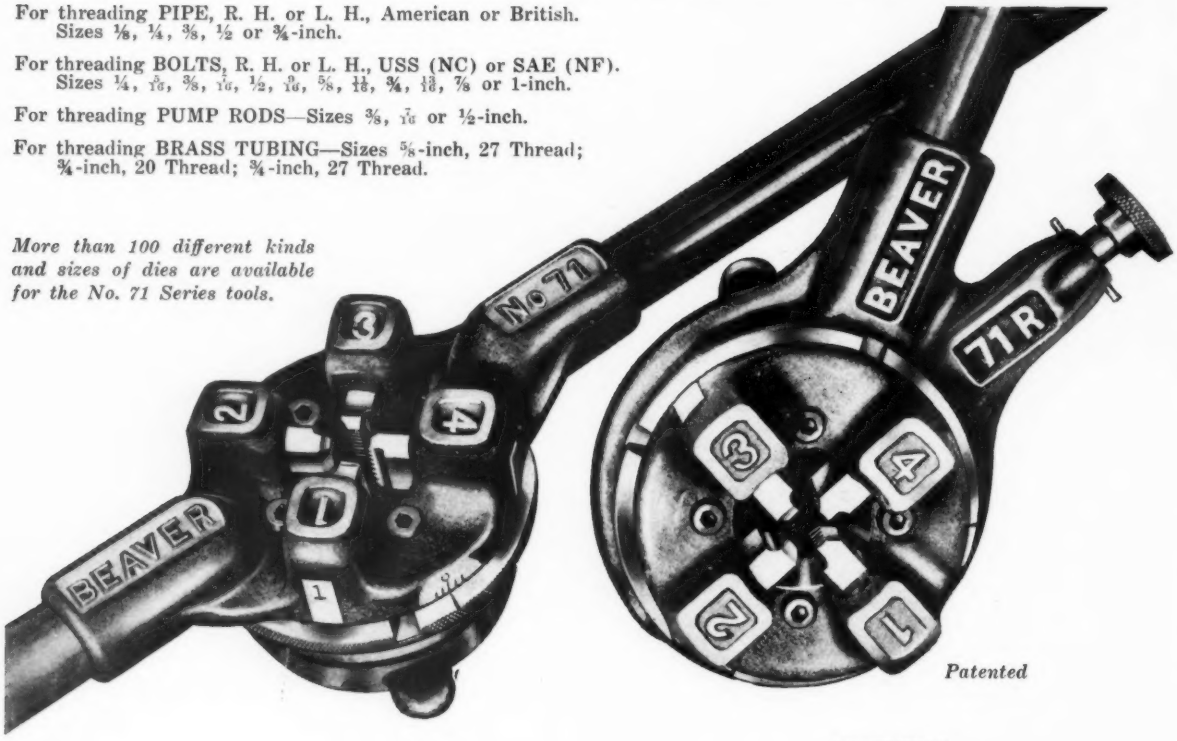
For threading PIPE, R. H. or L. H., American or British.
Sizes ⅛, ¼, ⅜, ½ or ¾-inch.

For threading BOLTS, R. H. or L. H., USS (NC) or SAE (NF).
Sizes ¼, 5/16, ⅜, 7/16, ½, 9/16, ⅝, 11/16, ¾, 13/16, ⅞ or 1-inch.

For threading PUMP RODS—Sizes ⅜, 7/16 or ½-inch.

For threading BRASS TUBING—Sizes ⅝-inch, 27 Thread; ¾-inch, 20 Thread; ¾-inch, 27 Thread.

More than 100 different kinds and sizes of dies are available for the No. 71 Series tools.



Patented

FOR high-precision pipe or bolt threading, we recommend the fully-adjustable BEAVER No. 71 Series. Of patented design, these tools offer such advantages as compactness; simplicity; adjustability for oversize or undersize threads; immediate chip clearance and easy oiling. Dies can be changed in 20 seconds—and NO TOOLS REQUIRED. No bushings either—a smooth-working universal chuck accurately centers the tool and insures straight threads. Note that the dies are up on top—where the long curling streamers from soft bolt stock cannot jam or clog these tools. Ideal for hand use—or with modern power units such as Beaver Model C.

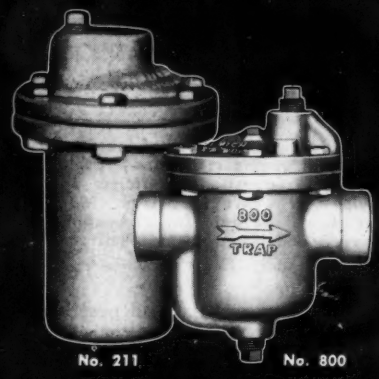
(Left) No loose bushings to bother with (or lose.) A smooth-working universal chuck centers the tool accurately—insuring straight threads.

(Right) You can get some idea of the compact design of the little No. 71 tool by comparing it with the hand in the upper illustration.

(Right) A small metal box is available to hold 8 sets of dies—also a larger metal kit box which holds a No. 71 or 71-R tool and many sets of extra dies.

BEAVER PIPE TOOLS

210 DANA AVENUE — ***48 YEARS OF HIGHEST QUALITY*** — **WARREN, OHIO, U. S. A.**



No. 211 No. 800

Above left — Armstrong bottom inlet—top outlet series trap.

Above right — Armstrong No. 800 side inlet—side outlet trap.

PROOF THAT ARMSTRONG TRAPS PAY DIVIDENDS:

COOKING TIME CUT 25% with use of Armstrong traps on steam kettles and vats. One trap on a steam coil has given dependable service for 18 years.—*Kerber Packing Co., Elgin, Ill.*

•

80% MAINTENANCE REDUCTION and 20% FUEL SAVINGS with use of Armstrong Traps.—*Milby & McKinney Co., Baltimore, Md.*

•

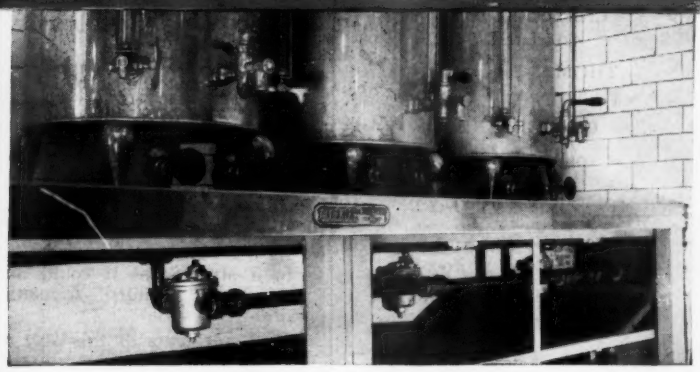
HEATING-UP TIME REDUCED 20%, FUEL CONSUMPTION 10% and MAINTENANCE COSTS 75% when manufacturer of food stuffs unit trapped 20 steam jacketed kettles with Armstrongs. —*Griggs, Cooper Co., St. Paul, Minn.*

•

50% REDUCTION in heating-up time achieved by changing over to Armstrong Traps.—*Preston's Pure Preserves, Ltd., Ville St. Laurent, Quebec.*

For Fuel Savings and Maximum Production

INSTALL AN INDIVIDUAL ARMSTRONG STEAM TRAP ON EACH UNIT



WHY UNIT TRAPPING IS ESSENTIAL: If you try to drain condensate from more than one steam-consuming unit with the same trap, sluggish heating and low temperatures will almost always result. This is because no two units condense steam at the same rate. The pressure will be lowest in the unit condensing steam the fastest. Condensate from the higher pressure unit will back up into the lower pressure unit (or close the check valve), temporarily blocking off its drainage. This prevents escape of air and condensate, lowers the machine temperature and wastes fuel. However, the use of a separate trap on each unit permits individual operation without any effect from different condensing rates. You get maximum temperatures and maximum production.

WHY *ARMSTRONGS* ARE BEST FOR UNIT TRAPPING: They not only discharge condensate as fast as it accumulates, but they discharge air as well. This is essential to fast heating and uniform high temperatures. Furthermore, you don't have to be afraid of increasing the number of traps in your plant because Armstrongs seldom need attention. They won't clog or stick; dirt is swirled right through; the chrome steel valve and seat and corrosion-resistant stainless interior stand up in constant service for years and years.

THE ARMSTRONG STEAM TRAP BOOK gives complete data necessary for selection, installation and maintenance of Armstrong traps. Send for a copy.

ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

ARMSTRONG *Inverted Bucket* STEAM TRAPS

No. 3 of a series of advertisements devoted to improving efficiency through better trapping.

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Letters from the Readers

This section is for open discussion of: any topic of interest to, or, in the sphere of the plant engineer; pertinent comment on articles published; and suggestions, criticism or commendation. Let the quips fall where they may. Material selected for publication will be paid for and, upon request, name and company connection will be omitted.

Who Was Careless?

So MUCH has been preached and printed about the necessity of allowing for expansion and contraction in steam piping that one reads with amazement that a man actually lost his life when an elbow failed because of poor design. It appears that not enough room was allowed for expansion and contraction between boilers. As a result the elbow was subjected to a stress that it could not withstand, and it failed. A man lost his life.

All accidents of this sort are preventable. The designer of the above piping layout very likely "knew better" but he may have been rushed. One more minute of thought given to that detail might have saved the man's life. Or, the checker should have caught the error. Sometimes installation men discover errors of this kind. Sometimes the operating men discover them. In this instance the mistake "got past" everybody.

W. F. S.

What Makes a Plant Engineer?

SINCE THE FIRST issue of your publication arrived I have been pondering as to just what makes a plant engineer, aside from years of practical experience. In our medium size plant the work that you say is the function of the plant engineer has been split between the production superintendent and the power plant engineer. But after seeing the chart depicting the different department heads I am wondering if it would not be a good idea for us to create a separate department under a plant engineer that would relieve the other men of some of their work, especially in view of the expansion that we are planning.

But there is one point that bothers me, and that is, what qualifications should I expect of the man I would hire to fill this position. Would it be best if he were a college graduate with a degree in some branch of engineering, and what is the most common degree among the plant engineers; electrical, mechanical, or civil.

Would it be better for me to select a man who has had practical experience in production, or one who has spent most of his time in power work. The reason this puzzles me is because I would need a man who would have a fair knowledge of production processes and methods, but at the same time the position requires a man who would know how to handle steam, air, and electricity and the machines that this power would apply to.

You can see what abilities I would like to have in the man that I hire but I am puzzled as to the qualifications I should expect of him. Perhaps some of your readers, themselves plant engineers, would care to help me by telling me what they have found is the necessary abilities, education, and practical experience, from their own experience.

H. F. C.
Plant Manager

Challenge of Ludwig's Belt Solution

I NOTICE in the November issue of PLANT ENGINEERING, page 66, by James Ludwig, a method for relieving strain on a bearing when using a short belt. This method is not very good as the driving as well as the driven pulley have only a small surface in contact with the belt. My method, which is standard practice, is to have only one idler. This idler is pressed against the belt by weight or spring. I also obtained good results by covering the small pulley with a piece of belting.

New York, N. Y. M. PODELL

COME IN AND SEE US

The Chicago Production Show will be held March 22, 23, 24, 1948, at the Stevens Hotel. This show is sponsored by the Chicago Technical Societies Council. While this is a production show it may be that some of the Plant Engineers or Chief Engineers plan to attend. If you should be in Chicago for this show won't you come up and see us. We would appreciate the opportunity of meeting you and having you tell us about yourself, your job, and your plant.—*The Editors.*

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A., $11.00 to Canada, $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.

This new seating arrangement

PUTS WEAR IN THE PROPER PLACE

Newly designed Jenkins gate valve uses hard, corrosion-resistant wrought Monel seat rings to assure tightness... at steam pressure up to 200 lbs.

JENKINS BROS.... well-known valve makers... have taken another big step ahead with their newly designed 270-U valve, shown at right.

As you probably know, the abrasive wear of steam and sharp particles under high pressures has long been a threat to the service life of many valves.

But look at the seating arrangement in this new Jenkins valve! The wedge is high-quality bronze — strong enough to last through many openings and closures, yet inexpensive and easy to replace.

For the seat rings — where the constant heavy wear comes — Jenkins Bros. have used Monel*. Work hardened to 190 Brinell or 2½ times harder than the wedge, they'll hardly ever have to be replaced. And since they are made of *wrought* Monel, Jenkins was able to hold the price of this new valve in the moderate range.

In tests, these seat rings stood up under thousands of openings and closings, at 200 lbs. steam pressure without a sign of wear.

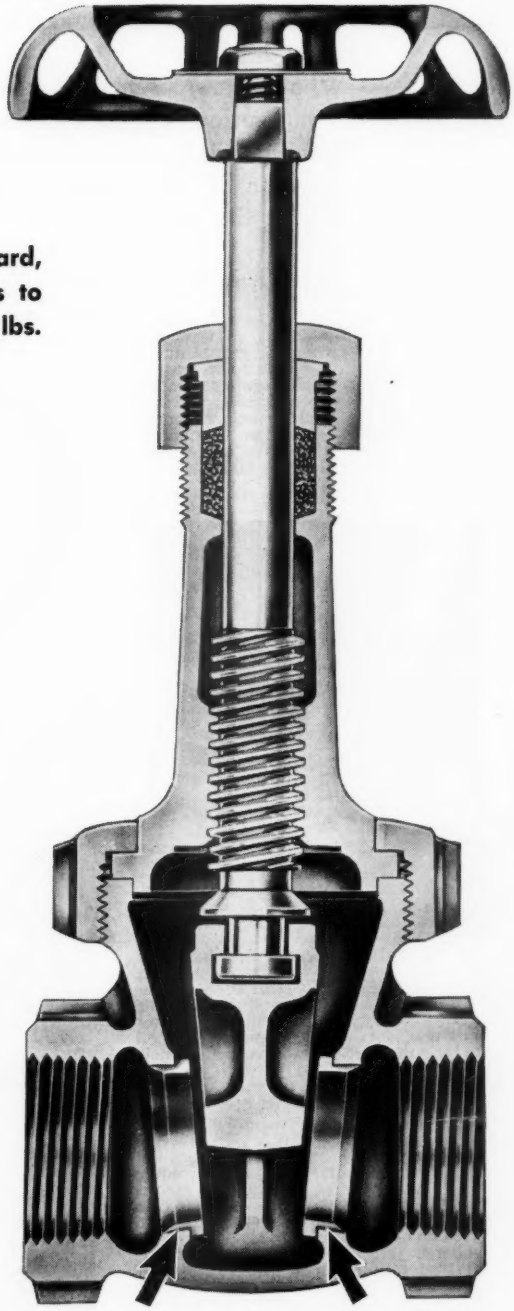
These Monel seats fight corrosion, too... another reason why Jenkins especially recommends this valve for severe conditions, such as those encountered in oil refineries, dye houses, as well as chemical, food, and rubber plants. Moreover, the Monel seats are galvanically neutral to the bronze wedge and body metal — even in salt or polluted water.

* * * *

What's your metal problem? If it's hardness, corrosion-resistance, strength, heat resistance, or a combination of these, find out about Monel and the other INCO Nickel Alloys.

With INCO, solving metal problems is a privilege. A brief letter concerning your requirements will start us working for *you*. Write today.

*Reg. U. S. Pat. Off.



Cross section of new Jenkins valve. Arrows indicate wrought Monel seat rings expanded into valve body which resist wear and corrosion. Tight-fitting bronze wedge is easily replaced, enabling valve to last indefinitely. Available in ¼" to 2" sizes to handle 200 psi steam or 400 psi water, oil, or gas.

EMBLEM OF SERVICE
INCO MONEL
TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

New Products and Methods

What's New? American industrial superiority is based upon doing things easier, faster and better. Here industrial ingenuity is summarized for your quick review. If you want additional information, have questions on specific applications, use the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 10 and 11 and 58-59

Die-Formed Paper Tubes

Item No. 1 It has recently been announced that die-forming is now included as regular or standard specification on all the manufacturer's square or rectangular paper tubes for coil forms or bases, without extra cost. These tubes for coil bases are made to specifications of quality kraft, fish paper, cellulose acetate or combinations, any length, and id or od, and are spirally wound.

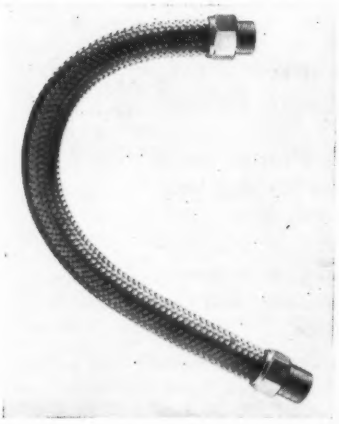
It is stated that among the advantages of these tubes are that they are designed to bring about practical elimination of the side bow permitting automatic stacking; stronger adhesion under die-formed heavy heat-treated compression, of the laminated materials; end of necessity of forming coils after winding; engineering to closer stack size, saving wire; speedup of coil production, and greater coil efficiency. Precision Paper Tube Co.

Rubber Strips

Item No. 2 A new method of forming bevels and decorative grooves on concrete surfaces by means of rubber strips attached to the forms instead of conventional wood strips has been recently announced. The rubber is said to produce a smooth finish free of blemishes and can be reused many times. The new strips are attached to the form with a waterproof adhesive, and are designed so that they can be removed easily without chipping the mortar. United States Rubber Co.

Flexible Metallic Tubing

Item No. 3 Flexible metallic tubing, made from monel metal and designed for use where severe corrosion or high temperatures are encountered, has been recently announced. Known as Titeflex monel metal tubing, it is supplied in the same sizes and with the same types of fittings as the standard Titeflex brass flexible tubing. It is furnished with



either single or double bronze braid and brass fittings. This tubing is being made for four temperature ranges, the range depending upon the melting point of the solder used in the seam of the innercore. Titeflex, Inc.

Motor Control

Item No. 4 A new starter for single phase motors has been designed for light service applications and is intended for across-the-line motor starting service. Two models are available, with either built-in pushbut-

ton or selector switch control station, in three sizes: 3, 5 and 7½ hp for 230 v service. The 3 and 5 hp sizes have dual voltage coils and will handle a 1½ and 3 hp motor respectively when connected for 115 v service. Westinghouse Electric Corp.

Paper Cutter

Item No. 5 A new paper cutter for cutting blueprints, photostats, work drawings, etc, has been developed. It is made of two sections, an upper part or cutting board, and a bottom section or base. A fixed cutting blade is attached to one end of the cutting board, and the other end of the board is hinged to the base, to allow up and down motion. The base piece holds one or two cutting blades at the cutting end. Two springs between

the cutting board and base return the cutting board to normal position after it has been depressed. Models range in size from 18, 24, 30, 36 to 42 in. cutting width. Hobbs Mfg. Co.

New Electrodes

Item No. 6 The Eutectic Welding Alloys Corp. has recently announced the development of two new steel electrodes called "Low Temperature" Eutec-Trodes 66 AC and 660 DC, for arc welding steel at low base metal heat.

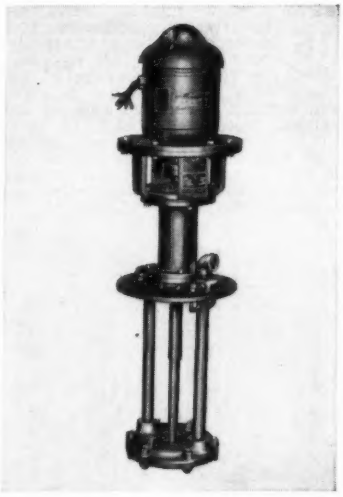
Low base metal heat means lower welding cost. Distortion is kept to a minimum eliminating costly holding fixtures and jigs. Rejects are reduced because of low base metal heat.

These electrodes are flux-coated universal electrodes for superior welding of all types of steel. They produce a smooth, high tensile, crack-resistant weld, and are particularly suitable for vertical position welding. For the troublesome job of welding low carbon steel to high carbon, EutecTrode 66 can be successfully used. Being a universal rod for all types of steel, this rod eliminates the necessity for determining the base metal before welding.

Preheating is unnecessary when using EutecTrode 66. This alloy is extremely useful for welding parts that would be difficult to preheat because of the size, inconvenience in handling, and time lost. It can be used for welding low-alloy, high-carbon, cold-drawn, and heat-resistant steels; also, overlaying and filling on all types of cast iron alloys that are used on glass molds, dies, and similar parts.

Overhead Bearing Pump

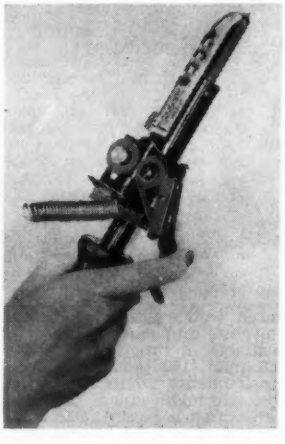
Item No. 7 An overhead bearing pump has been developed for use in pumping operations where a wet pit type pump is required, and where no submerged bearings are allowable. For this purpose anti-friction bearings of this vertical shaft pump



are supported in a pedestal attached to the floor plate. These anti-friction bearings are supported in what is described as accurately machined end caps clamped into the pedestal by means of two readily accessible bearing studs. The pump can be belt or motor driven. The type SW-O is designed for heavy liquids, hot liquids (up to 1000 F), or for liquids containing solids. Nagle Pumps.

Solder Feeding Attachment

Item No. 8 A new device, which feeds solder at the touch of the finger-tip, and which clamps on to any standard electric soldering iron, has been announced. Solder in short lengths, in small coils,



or fed from a spool as large as 25 lb can be handled. The device takes solder from 1/16 in. to 3/16 in. in diameter, and feeds up to 3/16 in. per stroke. Screw adjustment of the stainless steel nozzle guides solder exactly where needed, regardless of the size or shape of the particular soldering tip being used. Nelpin Manufacturing Co.

Respirator

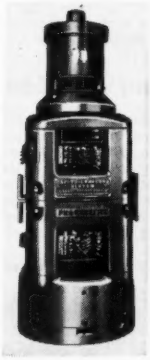
Item No. 9 A new respirator incorporating a new dust filter, designed for the protection of industrial workers exposed to poisonous and disease-producing dusts smaller in diameter than 24 millionths of an inch, has been recently announced. The respirator and filter are said to protect workers against toxic dusts such as lead, cadmium, arsenic, chromium; pneumoconiosis-producing dusts, and dusts from iron ore, coal, etc. The new filter is ⅛ in. thick and slightly over 5 sq in. in area. The new filter is equipped with a gauze prefilter for catching larger particles of dust and dirt. American Optical Co.

Resistance Welder

Item No. 10 A new kinetic stored-energy system for resistance welding is announced. This welder makes use of some of the best known electrical principles in providing a high electrical (dc) energy source for welding. It is a combination of an homopolar dc generator and a heavy flywheel driven by a conventional ac motor. Energy is stored up in the flywheel and reconverted to electrical power as needed for welding. This device is designed to make resistance welding equipment as easy to install as any other tool.

It is stated that this resistance welder permits dc spot, projection and flash welding with: limited power facilities, any 3-phase ac power supply, low power

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11 and 58-59



demand from lines, high power factor and a balanced load, no special transformers or distribution system, and no electrical interference with other equip-

(Continued on page 10)

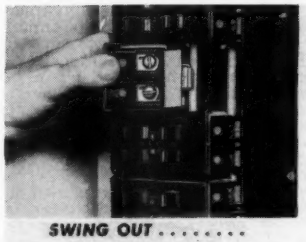
"Plug-In" Panelboard

Item No. 11 Greatly improved utilization of space on walls and columns is a major feature of this new "plug-in" panelboard with thermal-(coilless) magnetic multi-breakers. Due to the small size of the MO4 multi-breaker units, this panel affords increased gutter space (5½ in. gutters in 15 in. wide panelboard).

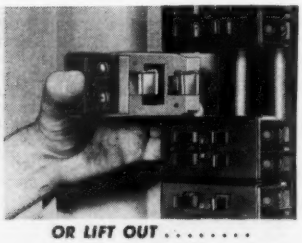
faced buss bars by means of positive-pressure contact jaws.

The high-speed, coilless magnetic and thermal trip of the MO4 breaker used in this new panelboard, gives adequate time lag for starting motors and tungsten lamp inrush currents. It trips as fast as one-hundredth of a second at current values slightly above operating range.

The breaker units regularly provide four single poles which

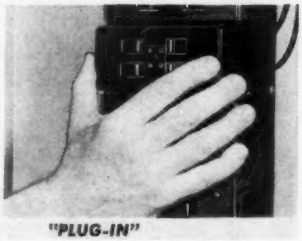


SWING OUT . . . . . .



OR LIFT OUT . . . . . .

ATTACH WIRES . . . . . .



"PLUG-IN"

The narrow, column type provides twice the number of circuits previously available in cabinets of similar size.

The "plug-in" feature of this new panelboard permits easy and speedy removal or insertion of multi-breaker units for future changes in circuit ratings or for additional circuits. These breaker units are mounted on silver-sur-

can be readily converted into two double poles by the insertion of handle ties, either in the field or at the factory.

NMO panelboards are furnished in 100 and 200 amp mains ratings, 120/240 volt a-c with 15, 20 and 30 amp branch circuits.

A bulletin giving complete information is available from Square D Company.

ment. It is designed to make possible the operation of resistance welding equipment through a simple air operated contactor of the carbon-disc type such as has been employed with storage battery powered welders. At present this welder is not available from stock. Progressive Welder Co.

De-Reeling Tension

Item No. **12** These new de-reeling tensions have been designed for faster coil winding, to permit more simultaneous winds, and to eliminate wire breakage and insulation damage. The tensions are manufactured in two models: one handling all gauges 44 to 38 Awg and the other for gauges 40 to 20 Awg.

This newly designed product permits

the degree of tension to be under fingertip control of the operator at all times, and does not require any tools to change adjustments for either tension or wire gauge. Special features of construction include a light-weight spindle and brake drum that reduces inertia and carryover; a sturdy shaft that runs on widely spaced oilless bronze bearings which help eliminate wobble and end play; and a specially designed brake band for smooth, jump-free braking action over a full tension range of 50 to 0.5 oz. Paper Machinery and Research, Inc.

RF Generators

Item No. **13** Three new 20 kw 450 kc radio frequency generators have been designed specifically for the metalworking industry, for consolidating generator, worktable

or sink, current transformers and water fittings into one easily installed, simple to operate unit.

The three generators are 1) Type A, a single position unit with built-in worktable and transite table top especially suited to brazing and soldering, 2) Type B, a single position unit for hardening applications with a built-in work sink, two sets of water fittings and a current transformer, and 3) Type C, a two position unit for soldering, brazing, and hardening applications, that combines a built-in work sink, two sets of coil and quench water fittings, and two current transformers with automatic transfer switch to provide two independently controlled work positions.

Stepless power output control is from 0 to 20 kw. Built-in plug-type outlets at work positions provide 230 v power for work handling equipment motors and for hand or foot control of both quench and heat. Westinghouse Electric Corp.

Hydraulic Gear Pump

Item No. **14** Two new hydraulic gear pumps, Models 9000 and 9075, have been announced. They are designed to assure efficiency at high pressures and for long, continuous operation. These pumps have been developed for continuous service at pressures up to 1000 psi, and for intermittent service at pressures up to 1500 psi. They are also suitable for pressure lubrication and oil hydraulic service in systems ranging from 100 to 1500 psi. Model 9000 has a capacity of 8 gpm displacement at 1800 rpm, and Model 9075 has 15 gpm displacement at 1200 rpm.

The pumps are simple in design, employing a minimum of moving parts. Wear-resisting materials are used. The pumps have a pilot-type flush mounting face. Aro Equipment Corp.

Grinder

Item No. **15** A new grinder, designed for small tool grinding, and adaptable for deburring, buffing, polishing and numerous special applications, has been announced.

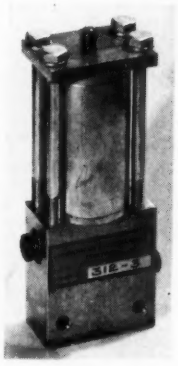
No tool is necessary to change the wheels and the changing of arbors, using similar size wheels, can be accomplished in a short time. The grinder has a three step pulley arrangement engineered to provide the proper spindle

speed for each wheel size. The standard provision is for speeds of 5600, 8000 and 12000 rpm to accommodate vitrified wheels up to 4 in. in diameter. An automatic safety feature prevents the careless use of a wheel of larger diameter than that safely recommended for the spindle speed to which the belt is adjusted.

The grinder has a custom built safety glass light shield designed to provide maximum light in work area. It has an accessible shelf for storage of mounted wheels. Corlett-Turner Co.

Solenoid Valve

Item No. **16** A new solenoid valve has been recently perfected. It is designed to be a compactly-built unit for all hydraulic systems, or for the handling of any non-corrosive fluids. It has a maximum working pressure of 3000 psi, and electrical requirements of 6, 12, 24, or 36 v dc, with low current consumption of 2.3 amp at 12 v. It is said to lock the fluid in one direction and to admit free flowing in the other direction. Waterman Engineering Co.



Solenoid Valve

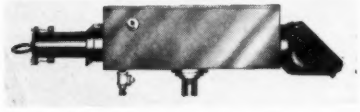
Protective Apron

Protective Apron

Item No. **17** A new protective apron, made of polyvinyl chloride-acetate, has recently been announced. It is designed to offer protection from acids, alkalis, grease, oils, and other occupational hazards, and weighs only 10 oz. Seams are heat sealed. An added safety feature is the trough designed to catch drippings which would otherwise fall on shoes and clothing. It is washable with soap and water. West Disinfecting Co.

Turbidity Recorder

Item No. **18** A new turbidity recorder has been announced. These instruments can be used to measure various undissolved substances or emulsions present in solutions, and can be applied to boiler



feedwater, water clarity problems, oils and solvents, and various fluids. They are available in range of 0 to 3 ppm, 0 to 50 ppm, 100 ppm, and up. The new instruments comprise a viewing chamber through which the solution to be measured is passed, and attached to one end is a light source and the other a photo relay unit. Ess Instrument Co.

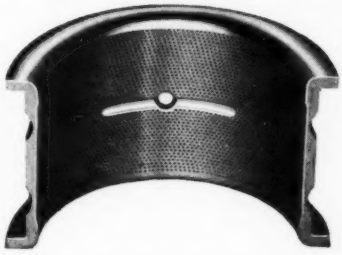
Gridded Bearings

Item No. **19** A new method to precision-build gridded bearings has been recently announced. Present applications of gridded

bearings are main and connecting rods of heavily-loaded Diesel engines and similar heavy-duty service. These bearings are said to be operating under loads of over 3,500 psi projected area, with shafts as low as 160 Brinell hardness; minimum depth of grids being 0.008 in.; and the minimum area of babbitt is stated to be 40 per cent.

These gridded bearings are customarily made as half bushings, but can be furnished as full cylindrical bearings if desired.

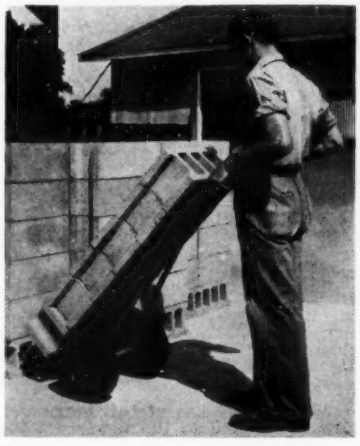
These bearings are designed to overcome objections to using bronze with a shaft that is not hardened, because the gridded bearing is "self-healing." In periods of great overstress, some of the babbitt is said to melt out of the



grids and forms a running surface that prevents seizure.
National Bearing Div., American Brake Shoe Co.

Hand Truck

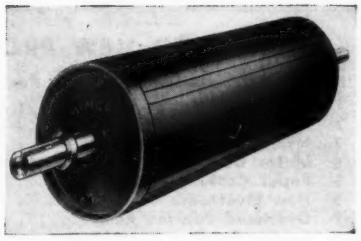
Item No. 20 A new hand truck has been developed to help eliminate hand loading and unloading and breakage. It is a hand operated pusher-type truck that can be used for moving concrete blocks,



cement bags and other heavy materials. It is stated that a 30 lb "handle load" transports 300 lb gross truck load. R. S. Reed Corp.

Magnetic Pulley

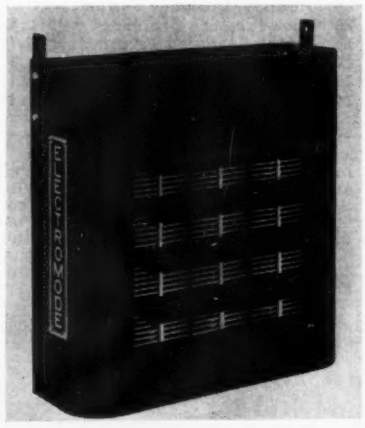
Item No. 21 The Perma-Pulley, a new permanent magnetic pulley with Alnico poles, developed by the Dings Magnetic Separator Co., is available in 53 sizes ranging from 12 in. diameter x 12 in. width to 30 in. dia x 60 in. width. Designed for use as head pulleys in a belt conveyor system or in a self-contained magnetic pulley-type separator unit, these magnets are used to remove magnetic substance automatically from non-magnetic materials carried on the belt.



Head plates of the pulley are nonmagnetic to prevent collection of magnetic material on the outside edges. A narrow gap design is used with nonmagnetic gap plates between the poles and equal magnetic strength across the full width of the belt.

Unit Heater

Item No. 22 An all-electric suspension type unit heater, designed to give forced warm air circulation in less than a minute after the current is turned on, has re-

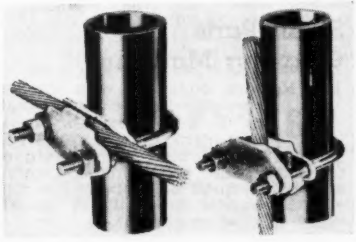


cently been announced. These units are available in capacities ranging from 10 to 60 kw, with Btu outputs from 34,150 to 204,900. Voltages range from 230 to 460.

There are no exposed hot wires, coils or glowing elements. Therefore, the makers claim, no fire hazard, deterioration or oxidation is possible. Heat is furnished by a patented safety-grid, consisting of a nichrome resistor wire surrounded by insulating powder inside a seamless sheath which, in turn, is sealed in a one-piece finned casting of high thermal conductivity aluminum. Thermostatic control may be provided if desired. Electromode Corp.

Ground Connector

Item No. 23 The cross-groove design of the new type GAR ground connector recently developed permits connection of ground bus



either parallel to or at right angles to driven rod or pipe.

Type GAR can be supplied for all sizes ½ in. rod through 6 in. ips and No. 8 sol. through 750 mcm ground conductor.

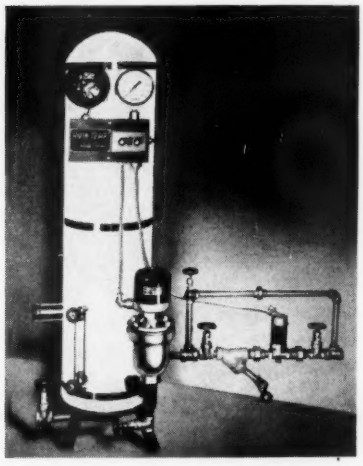
In both applications, type GAR can be easily slipped over driven rod even if the top has been mushroomed, and the connection is made secure merely by tightening two nuts on the U-bolt. Current-carrying, high copper alloy cast body with silicon bronze U-bolts, nuts and lockwashers permit the entire connection to be buried in the ground without danger of corrosion. Further details may be obtained from Burndy Engineering Co.

Heating, Drainage System

Item No. 24 The Fred H. Schaub Engineering Co. announces the development of its new Quik-Temp Heating and Drainage System for steam heated equipment.

Illustration shows standard 8 in. x 48 in. Quik-Temp Accumulator designed to handle drainage from as many as 12 machines or units with total steam consumption to 30 hp. It is built for working pressures up to 150 lb. While larger units with greater capacity can be built, the smaller standard size is predominantly used as it lends itself to convenient departmental installation.

Based on results obtained from initial installations, the manufacturer offers the system to all users of steam heated process equipment to which it



may be applied with a guarantee of 10 per cent minimum increase in production potential.

Cost of complete equipment for a single installation usually is less than $500.00. Temporary bulletin No. 252-A, describing the function and application of the system, is available from the manufacturer.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11 and 58-59

New Products and Methods

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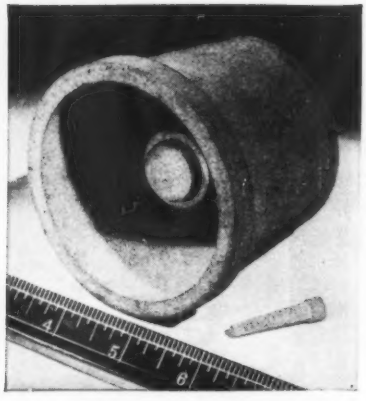
High-Pressure Drainage

Item No. 25 Wherever steam is used for heating process equipment, drainage of condensate continuously at high pressure has resulted in higher and more uniform temperatures with resultant increased production and reduced spoilage. Batches cooked in jacketed kettles for the preparation of jams and preserves and for making candy have been produced in 12 or 15 minutes instead of 20 minutes or more. In coil cookers of the type used for the manufacture of catsup, "break" time or the time required to establish an initial boil has been reduced 50 per cent to 75 per cent resulting in "break" time of less than 2 minutes in some cases. Wallboard and felt drying of 12-ft widths in blast-heated conveying tunnels have been similarly improved. One felt dryer now burns three carloads of coal a month instead of four, and this with increased production.

Metal Sponge

Item No. 26 A virtual metal sponge, available in a wide range of porosity has been designed for the filtering of liquids and solids of various densities, the diffusing or atomizing of liquids or gases, the control of rate of flow, the separation of liquids of different specific gravities, and the isolation of flame or fire. However, inasmuch as each application presents its own peculiar requirements, the material is

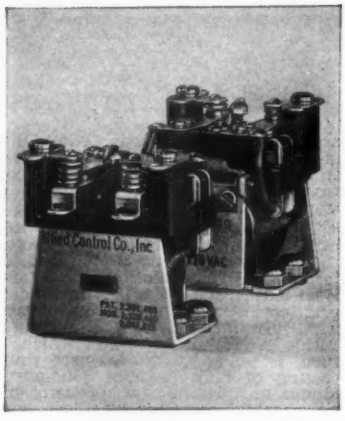


fabricated only to special order.

It can be easily fabricated into discs or flat plates, cylinders, truncated cones, plugs or inserts, and other shapes meeting mechanical considerations. Sizes range from tiny plugs or inserts fitting into fuel lines of internal-combustion engines, to large filter units as shown in the accompanying illustration. Henry L. Crowley & Co., Inc.

Small Relay Big Output

Item No. 27 The manufacturer says of the BO Power Relay that it is "one of the smallest relays giving the greatest output." Specially designed for convenience of wiring, together with small mounting area, the Allied BO is a patented multi-purpose relay. Its applications are widened by the fact that the BO is available for either a-c or d-c coil operation. Furthermore, tests in use in a wide variety of communication control equipment have indicated that the BO has excellent mechanical and electrical life.



Contact arrangement provides double pole, double throw or double break with ¼ in. contacts rated at 15 amp. Insulation is of molded bakelite throughout. Only 1-13/32, 1⅝, 1⅞ in. in size, the BO combines compactness with light weight.

Additional information on this relay may be had from Allied Control Co.

Small Parts Cleaning Machine

Item No. 28 Now equipped with its own specially designed motor made by L & R Mfg. Co. in its own plant, the Industrial Precision Cleaning Machine is again offered for the processing of instruments and small metal parts too difficult to handle manually or in any other type of equipment.

With liberal use of ball bearings in the motor and in the new shaft that supports the work basket, the equipment is engineered for long life and smooth, trouble-free operation. The work basket measures 3⅜ in. deep x 5½ in. in diameter into which the triple nesting baskets fit so that three sets of parts can be cleaned at one time without the danger of their becoming mixed.

The unit is completely self-contained and cleans, rinses, polishes and dries parts which are too delicate for manual handling or for processing in other types of equipment.

Unusual V-Belt Installation

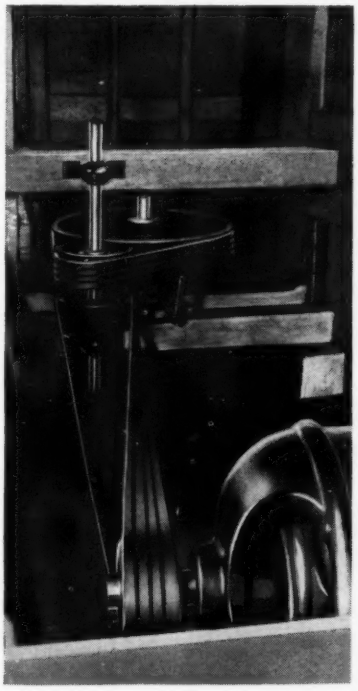
Item No. 29 An unusual multi-V belt installation to create a quarter-turn, double speedup drive in which a water wheel trans-

mits power to an electric generator is reported by The B. F. Goodrich Co.

Operation of the drive is saving the eastern plant where it is operated, an average of $300 monthly in electric bills.

The water wheel develops 25 hp at 257 rpm. The first speed-up drive uses a four groove C section 36 in. sheave on the water wheel shaft driving to a four groove, C section 13 in. sheave on the jack shaft, with four C-144 Multi-V belts set on 32.4 center distances.

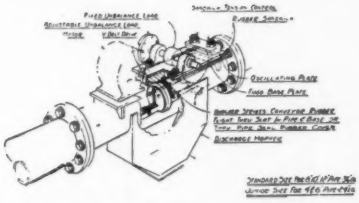
In the second speed-up drive a four groove, 13 in. C section sheave is used



on the shaft and a four groove, 10.2 in. C section on the generator, with four C-240 multi-V belts set on 101.6 center distance. The drive provides a speed of 900 rpm on the generator, sufficient to operate it.

Unbalanced Load Vibrator

Item No. 30 A new unbalanced load vibrator, as an accessory to a rubber flighted sealed pin chain pipe conveyor, has been recently announced. The purpose of this vibrator is to localize the action of vibration to that portion of chain over



the discharge opening so as to help minimize power required and to assure effectiveness. Vibration is delivered directly to rubber flight through a hole in the pipe and base. Under dust tight conditions impact bar is sealed. Impact bar is mounted on oscillating plate held by a rubber sandwich which is said to control amplitude of oscillations by means of its adjustable compression. Hapman Conveyors, Inc.

Arc Welder

Item No. 31 A newly perfected, portable combination battery charger and arc welder has been announced. The unit is available in two models: a 30 amp charger and 75 amp welder, and a 10 amp charger and 55 amp power factor corrected welder. They feature sturdy transformer construction. They come in a well designed case, and are sold complete with accessories. Larkin Lectro Products Corp.

Spray Gun

Item No. 32 A new high precision production spray gun for all types of finishes has been developed. The controls of this Model 18 are located at the back of the gun. The spray pattern is adjustable from round to flat with all intermediate patterns. The gun body is of drop-forged aluminum with black electrolytic coating for surface potection. The gun head and air nozzle are drop-forged bronze with very high plating. The material nozzle of the spray gun is hardened steel. A hardened steel needle valve is easily adjustable to compensate for wear. Its self-centering nozzle is designed on tapered seat principle. A cartridge type air valve is used. A large air passage through the gun helps increase its efficiency. All connections are of standard pipe threads. Binks Manufacturing Co.

Tunnel Kiln

Item No. 33 A new tunnel kiln, recommended for small batch production work, firing of ceramic parts, and heat treating of small parts on a production basis, has been announced. It features an electrice heating element which provides a maximum temperature of 2200 F, and is made ready for immediate operation by attaching the line to the fused switch box in the unit.

The new kiln is the pusher type, with small refractory trays being pushed through the inside of the 33 in. firing chamber by means of a variable speed drive. The firing zone is 10 in. long, and the size of the tray is 2⅝ in. by 3¾ in. Pusher mechanism as well as provision for loading and unloading is self-contained. The kiln operates on a single phase, 110 or 220 v ac, and has a current consumption of 2 kw. The over all dimensions are 102 in. long x 62 in. high x 24 in. wide. K. H. Huppert Co.

Welding Torch Holder

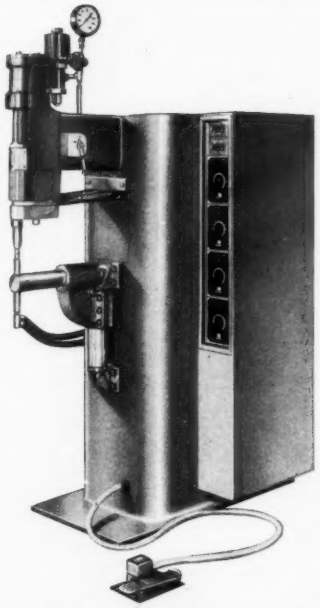
Item No. 34 A new portable straight cutter has been designed to hold the torch and to feed it along a straight line. By turning a geared crank at the end, the torch travels along a pre-determined line and cuts through the metal. The device is made to hold any torch, and has an adjustable holder so that the torch can be angled to cut, bevel or scarf. It has a positive feed so that the operator can direct the torch along a straight line as slow or fast as desired. A stainless steel wheel rolling along the work keeps the torch at a uniform distance from the job. The torch can be instantly released. The cutter is 5 ft in length, and weighs 42 lb. J. A. Campbell Co.

Press-Type Welder

Item No. 35 A new series of press-type welders, utilizing a standard frame size and offering a choice of 5 power ratings (20, 30, 40, 50 and 75 kva) and 4

New Products and Methods

throat depths (12, 18, 24 and 30 in.), with capacities on mild steel ranging from 0.016 to 0.125 in., has been announced. If desired, the welders can be furnished with "three-phase" control. This feature is said to reduce the required power rating by 50 per cent, operates on a balanced three-

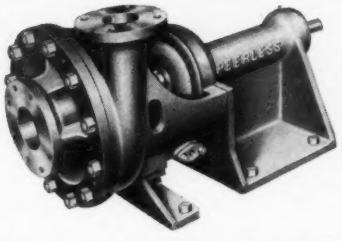


phase load at a power factor of 85 per cent or better, and permits the welding of aluminum, brass, etc., with nominal power supply. Welders up to 24 in. throat depth can be furnished with T-slotted platens for projection welding. Sciaky Bros.

Centrifugal Pump

Item No. 36 Incorporating a number of refinements in design to meet needs of industrial users of pumps handling acids and caustics, a new centrifugal pump has been developed.

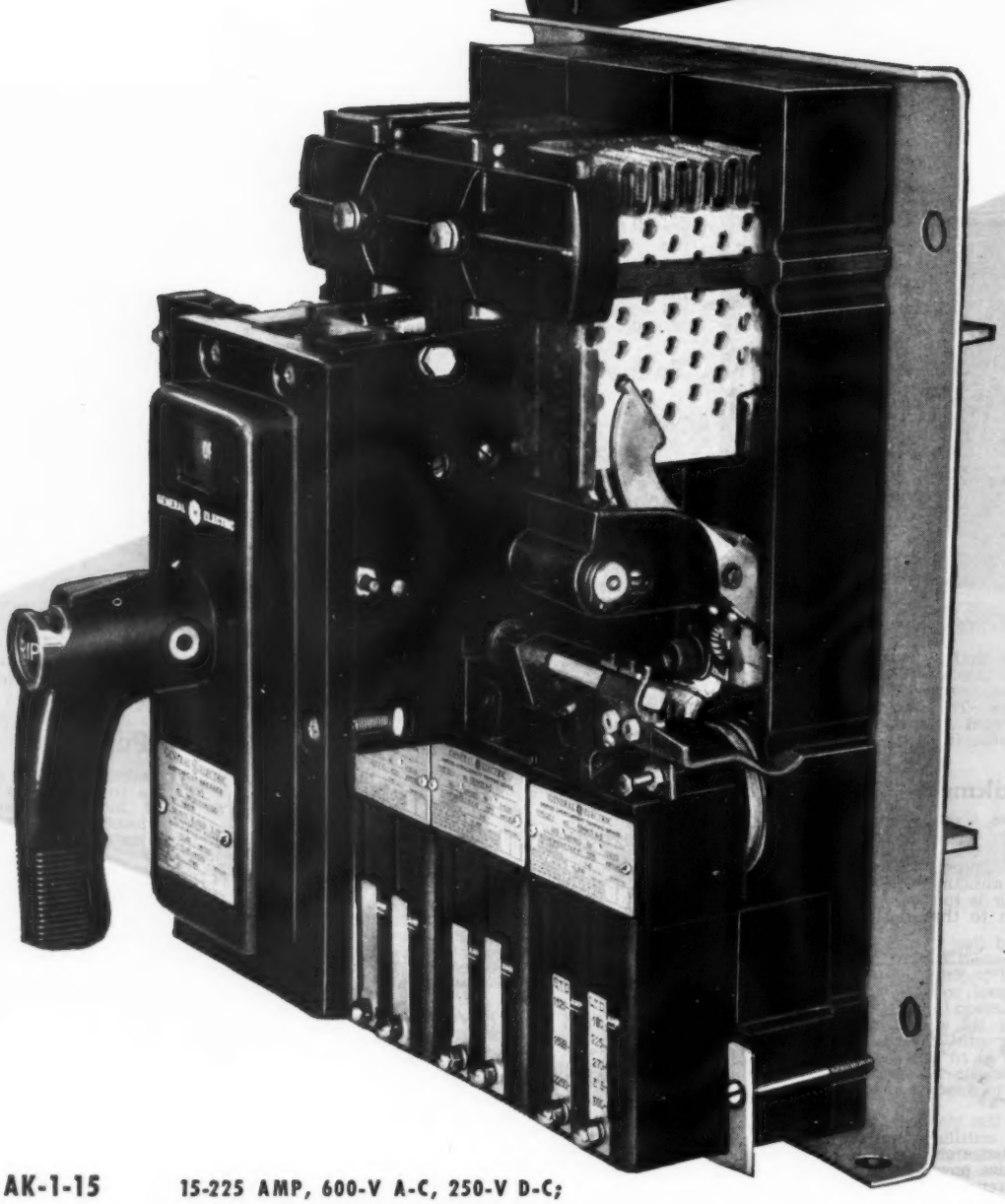
An improvement in the Type ACO



design is the integral casting of the pump volute and the drip pocket; any acid or caustic solution which leaks through the stuffing box, drips onto material capable of withstanding the corrosive qualities of the fluid. Furthermore, a large inbord end cap of special alloy is utilized to prevent any of the liquid being handled from finding its way past the special overhung

(Continued on page 14)

- - - the NEW AK-1



AK-1-15	**15-225 AMP, 600-V A-C, 250-V D-C; 15,000-AMP INTERRUPTING RATING**
AK-1-25	**35-600 AMP, 600-V A-C, 250-V D-C; 25,000-AMP INTERRUPTING RATING**

air circuit breaker

FOR MAXIMUM PROTECTION AND OPERATING EFFICIENCIES

You'll find that this new Type AK-1 air circuit breaker for indoor and outdoor service on low-voltage circuits offers you more advantages than any other protective device...

IMPROVED ARC INTERRUPTION ... less than one cycle ... decreases short circuit disturbances, means less strain on equipment and cables. Silver-alloy contact tips assure longer tip life, low resistance, and no oxidation or deterioration troubles.

MULTIPLE ARCING CONTACTS make possible—for the first time—a circuit breaker that has a short-time rating equal to its interrupting rating.

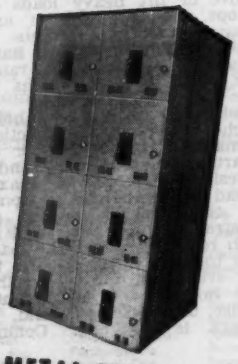
INTERCHANGEABLE TRIP UNITS are "sealed-in," operate in a non-sludging silicone fluid. You can easily install any AK-1 accessory in the field—auxiliary switch, solenoid closing mechanism and control, and shunt trip and undervoltage devices with terminal board. Access is from the front.

SELECTIVE TRIPPING on systems is possible because of adequate momentary rating and the new over-current trip devices. Faults are isolated; will not shut down a "selective system" by tripping the main breaker. Complete selectivity at all currents can be obtained with as many as four AK-s in series.

ALL-METAL BASE provides greater strength . . . Dust-proof, dust-tight, weather-proof, explosion-proof, and water-tight enclosures are available.

YOU GET ADEQUATE "IC" (interrupting capacity) with the new AK-1 breaker for the protection of your production, equipment, and personnel.

Investigate further the many advantages of the Type AK-1 air circuit breaker by contacting your G-E sales representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



METAL-ENCLOSED DRAWOUT UNITS

- SMALLER SPACE REQUIRED
- IMPROVED BUS CONSTRUCTION
- NEW RACK-OUT MECHANISM
- EASILY REMOVABLE BREAKERS
- ASK FOR BULLETIN GEA-4966

INDIVIDUAL BREAKERS

- ASK FOR BULLETIN GEA-4951

GENERAL ELECTRIC

New Products and Methods

(Continued from page 11)

water slinger into the bearing housing. In addition, the conventional screw type fitting in the drip pocket has been replaced by flange and two bolts which can be made of stainless steel, obviating difficulty in disconnecting drain for replacement or maintenance.

Type ACO pump is of the single stage, single suction type, equipped throughout with ball bearings and handling capacities up to 600 gpm against heads up to 200 ft. Peerless Pump Div., Food Machinery Corp.

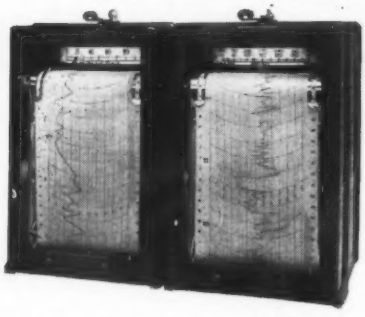
Hoist-Jack

Item No. **37** A new combination hoist and jack has been designed to move or lift heavy loads in shops, factories, utilities, and other industrial fields. Complete in three pieces (stand, hoist and handle), the new hoist-jack has a rated capacity of 2,000 lb, and weighs 23 lb complete. It is fully portable.

The hoist-jack features a hoist whose ratchet-and-pawl construction uses the smallest possible number of working parts; a safety-load handle which is designed to bend at maximum overload before there is any possibility of the chain breaking or of hooks straightening out; and a stroke which raises or lowers the load, that at the top brings the handle to a level just even with the top of the hoist frame horizontally. By mounting the hoist unit on the stand, a powerful jack is obtained. Coffing Hoist Co.

Wind Speed and Direction Indicator

Item No. **38** A new system has been designed for precision wind measuring and recording. This system provides wind speed



and direction measurements continuously on dials—speed in miles or kmph, or in knots, and direction in degrees and by the cardinal points of the compass. It is especially suited for industrial applications such as smoke and fume control.

A transmitter support holds a transmitter in a position which permits unobstructed exposure to the wind. The transmitter reacts to each gust and lull and change in direction, transmitting these changes electrically to precision indicators. The indicator assembly has a panel which contains two 3¾ in. indirectly illuminated indicator dials. The recorder is both an indicator and a recording instrument and may be operated separately or in combination with additional indicators. Friez Instrument Div., Bendix Aviation Corp.

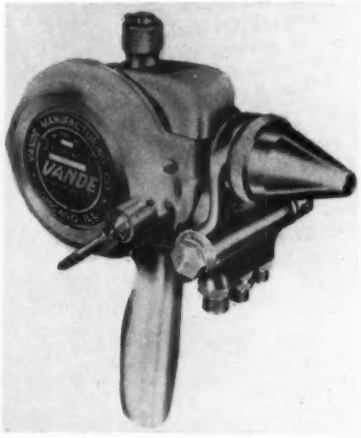
Barrel Lifter

Item No. **39** A new barrel lifter involving the use of a dual clamp has been recently developed. This dual clamp is the adaptation of the regular Volz clamp to a form usable for the barrel, being a device consisting of a cross arm of the width of the standard barrel, with a Volz

clamp attached to both ends of the arm. The center of the cross bar is provided with a ring though which the hook of the hoist or other lifting media is attached. The clamps can be instantaneously attached and detached to and from the barrel. The heavier the load, the tighter is the grip of the Volz clamp. Merrill Bros.

Metallizing Gun

Item No. **40** A new metallizing gun has been reported to permit faster and more thorough application of metals such as steel, aluminum, zinc, lead, bronze, copper. nickel and others Its nozzle incorporates a new development of mixing

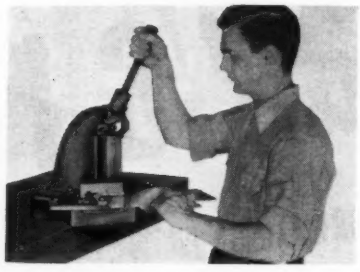


the gas at the point of combustion. Each wire nozzle is specifically designed to provide the exact volume for the gas used; acetylene, propane, or other gas. No air cap adjustments are needed. This feature is incorporated to eliminate backfire.

Another feature is the finger-tip turbine control. This is achieved by a compound turbine containing a rotor and stator responsive to opposing propulsion fluids. One propulsion fluid jet remains in a fixed position in the primary turbine. A second jet is directed by a control lever in the secondary turbine and either reduces or increases the primary turbine speed, thus affording wire feed control. Vande Mfg. Co.

Shearing Unit

Item No. **41** A new shearing unit has been designed to rapidly and accurately cut notches in sheet materials thereby eliminating dies for this application. A 90 deg notch of any size, within the capacity



of the machine, can be accurately cut in one operation either at the corner or in any position along the edge of the sheet. It is also possible to shear angles both smaller and greater than 90 deg. In addition; many straight shearing operations can be performed. The cutting range of this unit is said to extend from the lightest of materials in plastics, fibre, mica, leather and rubber to heavy gages of aluminum, cobalt steel chrome molybdenum, leaded brass and stainless steel.

The action of this notcher is obtained through a roller bearing cam which evenly distributes the shearing pressure simultaneously on both shear blades. O'Neill-Irwin Mfg. Co.

Wire Marking Labels

Item No. **42** The standard cards on which self-adhesive Quik-Label Wire Markers are mounted now come equipped with two Self-Starter Strips. Standard cards have one row of 1½ in. long labels and with this new feature the labels can be cut in half to make each label ¾ in. long.

The first Self-Starter Strip, as shown in the top picture, aids in the removal of the top row of ¾ in. long Quik-Labels by automatically exposing the end of each label for you to grasp instantly.

After the top row of labels has been used, the second Self-Starter Strip is removed to expose the ends of the ¾ in. long labels in the second row, as shown in the bottom illustration. Thus you can now get twice as many labels on a card, and the shorter ¾ in. labels are particularly suited for marking smaller diameter wires.

The manufacturer announces that all 500 stock Quik-Label cards now have two Self-Starter Strips and that any card can be furnished with either 1½ in. long labels for marking large wires, or ¾ in. long labels for wires of smaller diameter. Orders for stock cards are shipped immediately. W. H. Brady Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11 and 58-59

INSTRUMENTATION IS KING
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LESLIE Controllers and Regulators are precision-built, ruggedly constructed and feature, as *standard* trim, hard faced seat rings, 500 Brinell hardened main valves, corrosion resistant internal parts—all unbeatable combinations engineered to lower your power costs.

Pressure Reducing Valves—with narrow throttling range for fast response and high accuracy of regulation. Single-seated for positive dead-end control—low maintenance cost—all internal working parts renewable—complete overhaul without removal from pipe line.

Pressure Controllers—with choice of several operating mediums—air, gas, water or oil-operated, designed for non-continuous leakage operation, particularly important for intermittent control of steam flow and emergency make-up or cut-off requirements.

Diaphragm Regulating Valves—with single seated, fully balanced, no pressure drop limitation design. Smooth, throttling control and tight shut-off. Furnished up to 8" inclusive, semi-steel and bronze bodies. Cast steel, ½"—4".

Pump Governors—with automatic reset by balancing the delivered steam pressure with two equal and opposing metal diaphragms separated by a restricted orifice for reciprocating and turbine-driven pumps. Single seated, hand-wheel adjustment with wide adjustable pressure range.

Temperature Regulators—with anticipating action accomplished by controlling both pressure and temperature regulation with a single pilot valve. Rugged thermostatic element, diaphragm construction has 100°F. adjustable thermostatic temperature range.

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Baltimore, Md.	Houston, Texas	Philadelphia, Pa.	Spokane, Wash.
Birmingham, Ala.	Kansas City, Mo.	Pittsburgh, Pa.	St. Louis, Mo.
Boston, Mass.	Kingsport, Tenn.	Portland, Ore.	Syracuse, N. Y.
Bridgeport, Conn.	Los Angeles, Cal.	Providence, R. I.	Toronto, Ont., Can.
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Chicago, Ill.	Memphis, Tenn.	Rochester, N. Y.	Vancouver, B. C., Can.
Cincinnati, Ohio	Minneapolis, Minn.	Rutherford, N. J.	Wilkes-Barre, Pa.
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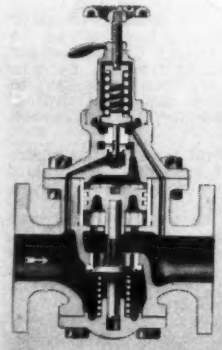
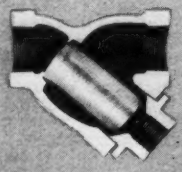
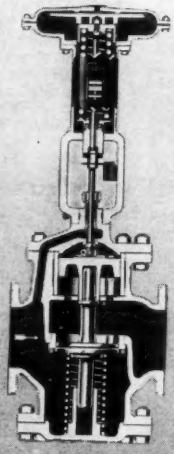
		Honolulu, Hawaii	



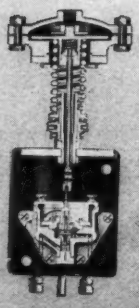
Pressure Reducing Valves for Steam, Air or Gas. Inlet pressures 25 psi to 1500 psi steam, to 3000 psi air or gas
Bulletin 461



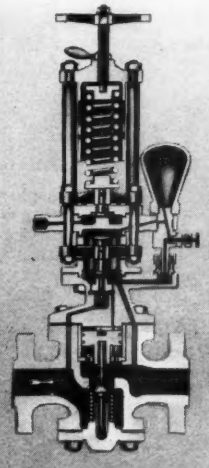
Self-Cleaning Strainers for steam, air, gas or liquid service.
Bulletin 465



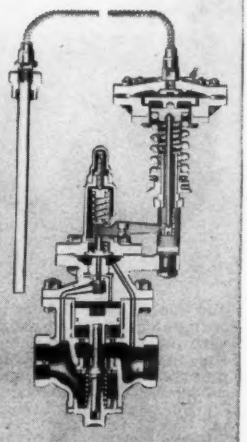
Diaphragm Regulating Valves for controlling steam, hot or cold liquids and gases using Instrument Control. Inlet pressures 0-1500 steam, 0-2500 cold liquid or gas.
Bulletin 462



Control Pilots for regulating flow of air, clean water or light oil to operate Diaphragm Regulating Valves.
Bulletin 462



Constant and Excess Pressure Pump Governors. For pump discharge pressures 25 psi to 1000 psi.
Bulletin 463



Temperature Regulators for control of steam, condensate, gas, or fluid, for process heating or cooling.
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ESTABLISHED 1900
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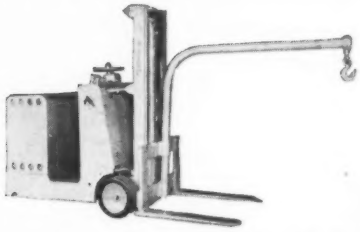
PRESSURE REDUCING VALVES • PUMP GOVERNORS • PRESSURE CONTROLLERS
TEMPERATURE REGULATORS • SELF CLEANING STRAINERS • LESLIE-TYFON WHISTLES

New Products and Methods

Rotating Carriage

Item No. 43 A hydraulically operated rotating carriage has recently been developed for use with power fork trucks. This carriage, when used in conjunction with the paper roll attachment, requires only 90 deg of the full rotation. The paper roll attachment for use with this rotating carriage consists of a full

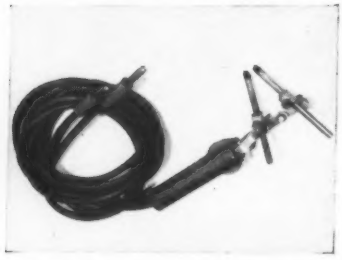


curved backplate, designed to fit the contour of the rolls, and a polished and ground toe plate with a beveled leading edge for entering under the headings of paper rolls without damaging them. The rolls may be either picked up or deposited in a vertical or horizontal position. Other attachments can be used for small castings, scrap metal, coal, or grain. Lewis-Shepard Products Inc.

Carbon Arc Torch

Item No. 44 A new carbon arc torch for brazing, soldering and supplying heat for light forging, preheating before welding and tempering operations has been announced.

Each torch comes complete with 2 ten ft extra flexible welding cable leads attached; one pair ¼ by 6 in. carbon



electrodes; and one pair ⅜ by 6 in. carbon electrodes. Leads are equipped with bayonet attachment plugs to fit the manufacturer's "Midget Marvel" and "Limited Input" welders. Westinghouse Electric Corp.

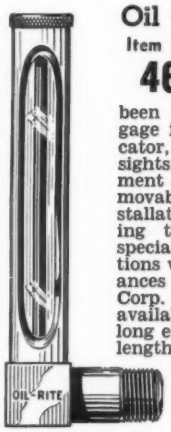
Dew Point Recorder

Item No. 45 Production of dew point measuring instruments for industrial use has been recently announced. It is said that they can be used in such varied applications as air conditioning, blast furnace operation, a weather station, gas distribution, and storage container research work.

The unique feature of this equipment is the patented measuring element, the Dewcel. This perforated metal cylinder contains the thermal bulb enwrapped with a saline-saturated woven glass tape and two windings of silver wire. Moisture determination by the Dewcel is based on the fact that for every vapor pressure in contact with a saturated salt solution there is an equilibrium temperature at which the solution neither absorbs nor gives up moisture to the atmosphere. The function of the

variable heat supply is to bring the Dewcel to this equilibrium temperature. This temperature, measured by the thermal tube, is transmitted to the recording instrument, and is read on the chart in degrees of dew point temperature. The Foxboro Co.

Oil Gage



Item No. 46 A newly developed oil-gage suitable for high tempertures has recently been announced. This oil gage is a liquid level indicator, with protected glass sights, permitting adjustment or removal of the removable shield after installation without disturbing the oil level. It is specially adapted for locations where assembly clearances are small. Oil-Rite Corp. Standard sizes are available with short and long elbow lengths. Special lengths and heights as well as drain plugs or other special features are available.

Lift Truck

Item No. 47 A new combination mobile crane, fork lift truck and ram truck has been recently announced. This truck is said to

help speed up loading, unloading, and stacking of materials and merchandise on shipping platforms and in and around yards, plants and warehouses.

The multi-purpose truck comes in two capacity sizes: 5 and 7½ t at 24 in. from heel to fork, and can travel 4 speeds forward and 4 speeds reverse, 2 to 18 mph. Silent Hoist & Crane Co.

Air Operated Drill

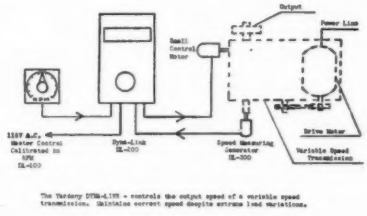
Item No. 48 A new air operated drill, called the "Utility Jackhamer," has been designed and built for general and plant maintenance work. Its light weight makes it suitable for ladder, scaffold, or overhead work, and can be used as a light paving breaker or for chiseling and channeling. By using adapters, star drills can

be used to drill holes 1⅛ in. and under. Also by removing the rotation pawls or using round shanked tools, it can be used as a light paving breaker or for chiseling and channeling. A built-in oil reservoir, in the handle, is said to supply ample lubrication and thus is one of the reasons for the low upkeep cost of the tool.

Throttled control permits the selection of the right kind of blow for any type of work or tool. Drills, chisels, gouges and moil points are a few of the classes of tools that may be used in their many forms. Ingersoll-Rand Co.

Electronic Control

Item No. 49 A new electronic control device, especially designed for industrial applications of variable speed power transmission,



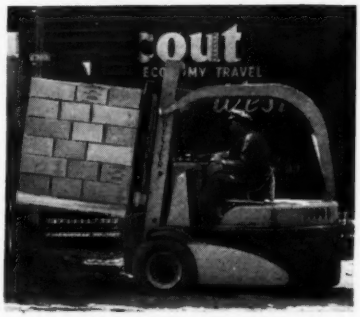
The Yardeny DYNA-4.195 - controls the output speed of a variable speed transmission. Maintains correct speed despite extreme load variations.

has been recently developed as a packaged unit. It is said that it controls the output speed of a variable speed transmission, and maintains a correct speed despite extreme load variations. It is also claimed that the "Dyna-Link" system can at will maintain several isolated drives precisely at the same speed as adjusted on the master control dial, or maintain preset (adjustable) speed ratios between several different systems (conveyors, etc.).

It is further claimed that if the drive slows down due to an increase in the load, the controller automatically detects the difference in speed and corrects the adjustment. It can be applied to conveyors, textiles, chemical industries, etc. Yardeny Laboratories, Inc.

Lift Truck

Item No. 50 Designed to handle an average of at least 7 out of 10 materials handling jobs in industry at speeds up to 12 mph, a new fork-type lift truck has been announced. It is made to work in close quarters as its single steering



wheel is mounted on trunnions at the rear end to allow a 77 in. turning radius. Its overall width is 42 in.

The truck lifts to a 9 ft height with optional lifts of 6 to 12 ft available. An overhead guard protects the driver. The truck contains pneumatic tires, spark arresting mufflers and hydraulic brakes. Lift and tilt mechanisms are hydraulic. Hyster Co.

Mobile Crane

Item No. 51 Designed to handle loads up to its 10,000 lb capacity, this mobile crane can be used for handling a wide variety of heavy and bulky materials. One of its most common applications is in loading and unloading gondola freight

cars. The unit has pneumatic tires, is 152 in. long and 75 in. wide.

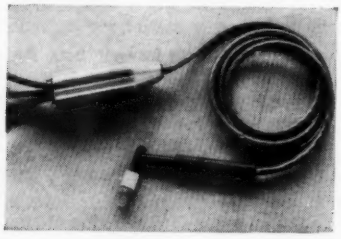
Operation is by standard automotive type controls. The boom is adjustable to five positions. The 40 hp gasoline motor furnishes power for speeds up to 10 mph in either direction. The tires are protected by a heavy apron which can be also used in spotting railroad cars. Hyster Co.

Aluminum Eggcrates Louvres

Item No. 52 The manufacturer recently announced a change over from steel to aluminum eggcrate Louvres. Considering the many times a Louvres is handled during the life of a fixture, the inherent weight advantage of aluminum is a real benefit to the user. Rigidity of the eggcrates is assured by the use of heavy gage aluminum and their special "powerpiened" construction. As a further convenience in maintaining Louvred fixtures, standard eggcrates now have handy hinging features that work with all standard fluorescents. Edwin F. Guth Co.

Heliweld Holder

Item No. 53 A new, water-cooled manual Heliweld holder has been designed for continuous production work with the inert-gas-shielded arc welding method. It

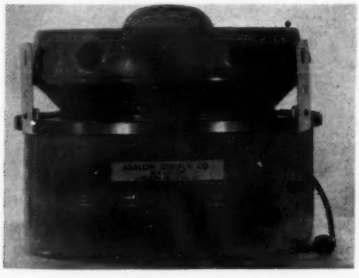


features an all-plastic exterior, insulated for maximum protection and efficient operation; a gas cap made of non-conducting material and a light, flexible cable encased in a durable, translucent plastic cover.

The new holder has a current capacity of 300 amp ac or dc and is fully insulated for high-frequency current. It is approximately 10 in. long, weighs about 28 oz and handles tungsten or carbon electrodes up to 3/16 in. diameters. Air Reduction Sales Co.

Industrial Humidifier

Item No. 54 A new humidifier requiring no steam, no pumps and no compressors, has been designed to be noiseless in operation, completely self-contained



and to atomize moisture in a vapor form finer than cigarette smoke. In the new model, the lower pan is completely covered and the air is brought in from the bottom through a fiberglass filter. No return waterline is needed. It has a vaporization capacity over one gph and its ball bearing motors draw less than 100 w per unit. Automatic controls for close regulation of percentages of relative humidity are also supplied. Abbeon Supply Co.

Flexible Welder

Item No. 55 The special feature of this machine is that the welding nozzle, at the end of a 20 ft long flexible hose, when held in the operator's hands, can be moved from one weld to another without stopping to set up track, carriage, or other guiding equipment. Granular welding composition is continuously supplied to the welding nozzle by compressed air from a storage tank

New Products and Methods

included on the main machine assembly. The welder has a capacity of

900 amps, either d-c or a-c, which may be supplied from any welding generator or transformer. Compressed air at about 35 psi pressure is required to force the granulated composition through the flexible tube to the nozzle. Linde Air Products Co.

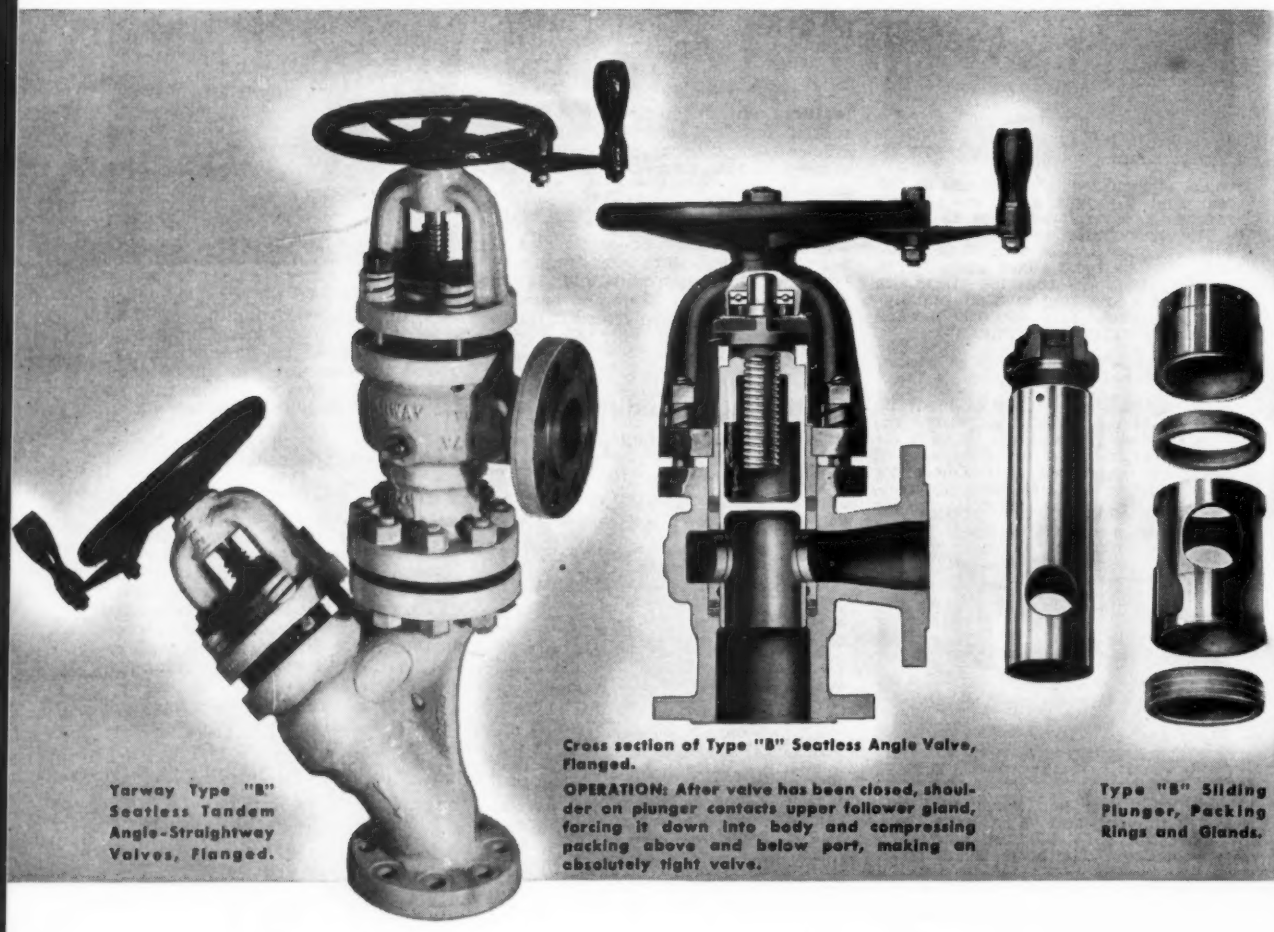
Fire Extinguisher

Item No. 56 A new tire inflator-fire extinguisher is now available in a heavy duty model for emergency use in industrial plants. This model contains 2½ lb of carbon dioxide and can be used for extinguishing larger inflammable liquid, grease, oil, electrical and wood surface fires. In addition, it will inflate not only the largest commercial

tires, but also a dozen average size passenger tires. The cylinder measures 17 in. long and 3½ in. in diameter, and weighs 8½ lb. Power-Pak Products, Inc.

NO SEAT!

TO SCORE...WEAR...CLOG...LEAK



Yarway Type "B" Seatless Tandem Angle-Straightway Valves, Flanged.

Cross section of Type "B" Seatless Angle Valve, Flanged.

OPERATION: After valve has been closed, shoulder on plunger contacts upper follower gland, forcing it down into body and compressing packing above and below port, making an absolutely tight valve.

Type "B" Sliding Plunger, Packing Rings and Glands.

Yarway Seatless Blow-Off Valves have become standard in more than 12,000 boiler plants because they eliminate a common source of trouble and expense with conventional type blow-off valve operation.

Yarways have no seat to score, wear, clog and leak!

This famous seatless design, first introduced by Yarway more than 35 years ago, has been constantly improved and adapted to meet modern service requirements. Mechanical and metallurgical research in Yarway's own unique Steam Laboratory anticipates changing conditions . . . assures the finest in blow-off valves for today's boiler plants.

There is a Yarway Blow-Off Valve for every pressure. For complete details of valves for pressures up to 400 psi., send for Bulletin B-424; for higher pressures ask for Bulletin B-432.

YARNALL-WARING COMPANY
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YARWAY BLOW-OFF VALVES

Tips on Practical Pipe Fitting

By THOMAS TRAIL

Practical tips on how to measure, cut, thread, prepare, and assemble piping . . . Check list of pipe fitting tools . . . How to prepare a pipe joint . . . Planning the installation . . . How to accurately measure, cut, and thread pipe . . . Proper use of pipe wrenches . . . Pipe line supports . . . Capacity of pipe lines . . . Draining water pipes...Installation of protective valves

PIPING INSTALLATION and maintenance constitutes a considerable proportion of the maintenance work in the modern plant. For this reason it is well to have a practical knowledge of pipe fitting including details of measuring, preparing and installing threaded piping so that the work may be done efficiently.

As with all types of work, the first requirement, after knowledge, is proper tools. A well equipped shop should include the following tools as a bare minimum: (1) Two each of 8, 10, 14, 18, 24 and 36 in. pipe wrenches which will handle pipe from ⅛ to 3 in. or even larger; (2) two ratchet type reamers, one having a capacity of 2 in. pipe and the other of 4 in. pipe; (3) two pipe cutters of 2 and 4 in. capacity respectively; (4) two chain tongs capable of handling 4 in. pipe; (5) one or more sets of ratchet type threading stock and dies covering each pipe size from ⅛ to 1½ in.; (6) and, a ratchet set covering the sizes from 2 to 4 in.

Where considerable pipe work is taken care of it is highly desirable to have a portable motor driven pipe machine. Such a machine, shown in Figs. 1 and 2, is very convenient. It will cut, ream and thread pipe to 2 in., and, with its accessory power take off and threading attachment, will thread pipe to 4 in. in size. A machine of this type will handle pipe much faster than the job can be done by hand, will conserve energy, and, will produce consistently good threads. The 2 to 4 in. capacity ratchet stock and dies are convenient but not essential where a pipe machine of this type is available.

A substantial and portable pipe vise bench is very desirable. This should be built of heavy wood, solidly constructed, so as to withstand rough usage and provide a firm support for a pipe vise. The vise should preferably be of a type that will permit the pipe to be removed easily from the side of the vise. A good plan is to equip the bench with a vise at each end, one of them handling up to 2 in. pipe and the other up to 4 in. pipe. One vise can be a side opening and the other a chain type or both may be side opening types. Other equipment required are the conventional mechanic's tools.

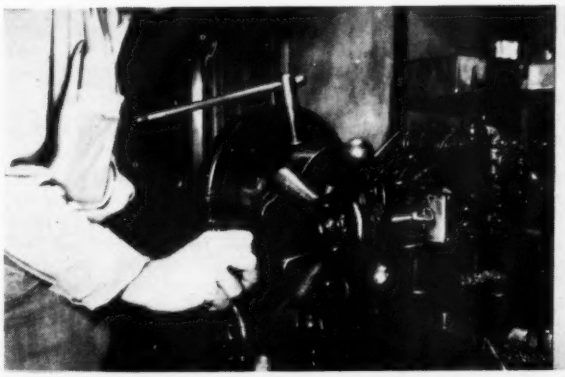
All pipe threads should be given a generous uniform coating of compound before assembly. There are a number of such preparations on the market. It is important to use a good grade in order to insure leakproof joints. Where joints are difficult to keep tight, such as on oil lines, a mixture of litharge and glycerine is satisfactory as a thread compound. However, such joints are difficult to unscrew after the compound hardens.

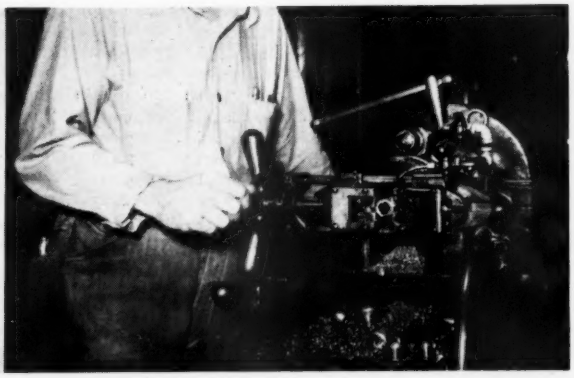
To prevent the threads of such parts as union compression nuts and valve bonnets from rusting or sticking it is advisable to coat them with graphite grease or a mixture of machine oil and powdered graphite. This is also helpful as a coating on both sides of gaskets to prevent sticking and tearing when disassembling.

There are two principal types of threaded pipe, iron or steel and brass. Steel pipe is widely used in both black and zinc coated (galvanized) forms, galvanized steel pipe being widely used for water supply. Wrought iron pipe is also used especially for heating and steam condensate lines. Brass pipe, although higher in cost, is used where it will serve better than steel or wrought iron, on certain steam and steam condensate installations, water supply, process lines, etc. Steel, wrought iron and brass pipe have identical external diameters in the same nominal sizes. The internal diameter, however, varies according to the material of which it is made and the strength rating. This is shown in Table I.

Pipe fittings are made of malleable iron, cast iron and brass for ordinary low and medium pressure uses. Malleable iron and brass fittings are used for water supply, while cast iron fittings are employed on low temperature steam lines and on steam and hot water heating lines. Table II gives the necessary fitting dimensions of malleable iron and brass fittings, and Table III gives the same information for common sizes of cast iron fittings.

Accurate pipe fitting requires care in measurement, cutting and threading. All measurements should be made to the nearest sixteenth of an inch. Figure 3 shows how to proceed in preparing a section of 1 in. pipe to be fitted into two 1 in. malleable





Figs. 1 and 2. Portable motor driven machine for cutting, threading, and reaming pipe up to 2 in. in diameter. Fig. 1. Left: Threading attachment. With power take off, this machine will thread pipe to 4 in. diam. Fig. 2. Right: cutting attachment

Table I. Dimensions for the more common sizes of brass, steel, and extra strong steel pipe

Nominal Pipe Size	Actual External Diam	Actual Internal Diameter All Dimensions in Inches Brass	Steel	St. X Strong	Actual Thread Length	Effect. Thread Length
1/8	13/32	9/32	17/64	7/32	3/8	1/4
1/4	35/64	3/8	23/64	19/64	9/16	3/8
3/8	43/64	1/2	1/2	27/64	5/8	7/16
1/2	27/32	5/8	5/8	35/64	3/4	9/16
3/4	1-3/64	53/64	53/64	47/64	13/16	9/16
1	1-5/16	1-1/16	1-3/64	61/64	15/16	11/16
1-1/4	1-21/32	1-3/8	1-3/8	1-9/32	1	11/16
1-1/2	1-29/32	1-19/32	1-39/64	1-1/2	1-1/32	3/4
2	2-3/8	2-1/16	2-1/16	1-15/16	1-1/8	3/4
2-1/2	2-7/8	2-11/16	2-15/32	2-5/16	1-9/16	1-1/8
3	3-1/2	3-9/32	3-1/16	2-29/32	1-5/8	1-3/16
3-1/2	4	3-3/4	3-35/64	3-23/64	1-11/16	1-1/4
4	4-1/2	4-1/4	4-9/32	3-53/64	1-3/4	1-5/16

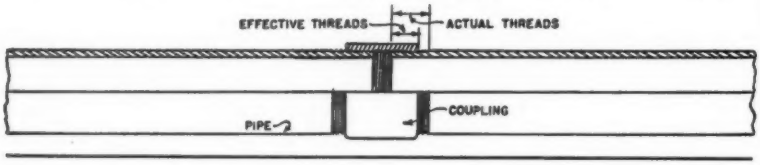


Table II. Dimensions of malleable iron and brass fittings of the commonly used sizes

Pipe Size	Dimension in Inches A	B	C	D	E	F
1/8	11/16					1-1/2
1/4	13/16	3/4			1-1/16	1-5/8
3/8	15/16	13/16	2-1/8	1-7/16	1-3/16	1-3/4
1/2	1-1/8	7/8	2-1/2	1-11/16	1-5/16	1-7/8
3/4	1-5/16	1	2-7/8	2	1-1/2	2-1/8
1	1-7/16	1-1/8	3-7/16	2-7/16	1-11/16	2-3/8
1-1/4	1-3/4	1-5/16	4-1/16	2-15/16	1-15/16	2-5/8
1-1/2	1-15/16	1-7/16	4-1/2	3-5/16	2-1/8	2-15/16
2	2-1/4	1-11/16	5-7/16	4-1/16	2-1/2	3-1/4
2-1/2	2-11/16	1-15/16	6-1/4	4-11/16	2-7/8	3-9/16
3	3-1/8	2-3/16	7-1/4	5-9/16	3-3/16	3-15/16
3-1/2	3-7/16	2-3/8				4-5/16
4	3-3/4	2-5/8	8-7/8	6-15/16		4-5/8

iron fittings. First the center to center distance of the two pipe lines is measured. As shown, this is 3 ft, 6 in. Then the center to face dimensions of the two 1 in. fittings is obtained from Table II. This is 1-7/16 in. for each fitting. Adding the fitting dimensions we get 2⅞ in. Now check the effective thread length for 1 in. pipe in Table I. This is 11/16 in. Doubling this (because there is a thread on both ends of the pipe) gives a total of 1⅜ in. Subtracting this sum from 2⅞ in. leaves 1½ in. This figure is then subtracted from the center to center measurement of the fittings at each end of the pipe (3 ft, 6 in.). The answer is 3 ft, 4½ in. or the actual length of the pipe needed.

If the fittings used are cast iron, their center to face dimensions should be obtained from Table III.

In determining the length of the angle pipe needed for an angle offset, as shown in Fig. 4, proceed as follows: First obtain the center to face dimensions of the two fittings from Table II. These are 4-1/16 and 1-11/16 in. respectively. Adding these figures gives a total of 5¾ in. Next check Table I to get the effective thread length for 2 in. pipe. This is ¾ in. Doubling this figure gives 1½ in. and subtracting this from 5¾ in. leaves 4¼ in.

To obtain the center to center distance of the fittings at the ends of an angle pipe (such as is shown in Fig. 4) 5 in. must be added for every foot of the center to center distance of the parallel pipe lines, where the offset angle is 45 deg, or, 12 in. for a 60 deg angle. Thus 5 in. multiplied by the 2½ ft distance equals 12½ in. Hence the center to center distance of the fittings will be 2 ft, 6 in. plus 12½ in. or a total of 3 ft, 6½ in. Now deduct from this figure the result of the previous calculations, 4¼ in. The answer is 3 ft, 2¼ in., the actual length to cut the angle pipe.

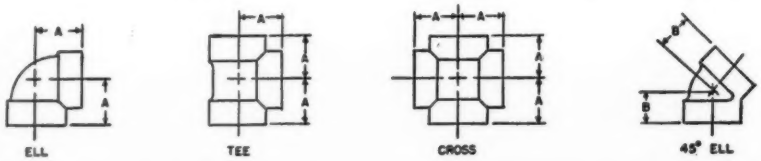
In cutting pipe be sure to have the cutter wheel exactly on the measurement mark to insure cutting the pipe to the correct length. Where cutters having cutting tools are employed, offset the cutting tool completely from the mark so that the edge of the tool is at the outside of the mark. Otherwise the tool will remove metal from the pipe length being prepared. The newly cut pipe end should be reamed sufficiently to produce a slight bevel sufficient to remove burrs left after cutting.

In threading pipe be sure the dies are correctly matched, properly set and securely tightened. When starting a thread, a light pressure should be applied to the die stock to hold the die against the end of the pipe and help the starting threads take hold. Afterwards the dies will feed automatically. This applies to both hand and power threading.

While threading pipe, a generous

Table III. Dimensions of cast iron fittings of the commonly used sizes

Pipe Size	Dimensions in Inches A	B	Pipe Size	Dimensions in Inches A	B
	125 LB SERIES			250 LB SERIES	
1/4	13/16	3/4	1/4	15/16	13/16
3/8	15/16	13/16	3/8	1-1/16	7/8
1/2	1-1/8	7/8	1/2	1-1/4	1
3/4	1-5/16	1	3/4	1-7/16	1-1/8
1	1-1/2	1-1/8	1	1-5/8	1-5/16
1-1/4	1-3/4	1-5/16	1-1/4	1-15/16	1-1/2
1-1/2	1-15/16	1-7/16	1-1/2	2-1/8	1-11/16
2	2-1/4	1-11/16	2	2-1/2	2
2-1/2	2-11/16	1-15/16	2-1/2	2-15/16	2-1/4
3	3-1/16	2-3/16	3	3-3/8	2-1/2
3-1/2	3-7/16	2-3/8	3-1/2	3-3/4	2-5/8
4	3-13/16	2-5/8	4	4-1/8	2-13/16



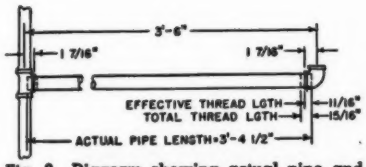


Fig. 3. Diagram showing actual pipe and thread lengths for 1 in. section of pipe fitted into two 1 in. malleable iron fittings

quantity of good grade cutting oil should be applied to the threads. Considerably more oil is required for power threading because of the increased speed. Lard oil is best but any good grade of cutting oil will be satisfactory.

The correct length of thread will usually be obtained when about two threads are projecting beyond the dies, on ratchet or power machines, or, four threads where solid die stocks are used. It is always best, however, to check the thread length after the dies have been backed off to be sure it is in accordance with the length given in Table I.

To insure tight joints all pipe threads should be carefully and completely coated with joint compound before screwing into valves or fittings. The compound should be sufficiently liquid to permit penetration to the bottom of the thread grooves, but, not so thin as to run off the threads. Compound that is stiff or hard should not be used.

Pipe Wrenches

Fittings should be screwed onto pipe tightly enough to produce leak proof joints but not excessively tight. The use of the proper size wrench will insure the proper degree of tightness. For pipe: from ⅛ to ½ in. use an 8 in. wrench; from ½ to ¾ in. use a 10 inch size; from 1 to 1¼ in., a 14 in. wrench; from 1¼ to 1½ in., an 18 in. wrench; from 2 to 2½ in. a 24 in. wrench; and from 2½ to 3 in. a 36 in. wrench. For larger pipe a 48 or 60 in. wrench or chain tongs may be used.

When screwing a valve or fitting onto a pipe it is better to apply the wrench only to the end that is being threaded onto the pipe. This will help insure against distorting the valve body or the fitting. It will also help prevent crushing the metal since the pipe will act as a support. The use of a monkey wrench on valves is preferable to a pipe wrench because the latter cuts and scars the metal.

Table II gives the dimensions of a few of the principally used malleable iron and brass pipe fittings. These are employed chiefly for water piping. The dimensions given permit calculations to be made in arriving at the correct lengths to cut connecting sections of pipe. In addition to the fittings shown, a number of other fittings of this type can be obtained for particular applications. These include, union ells, tees, 45 deg ells; street ells, tees and 45 deg ells; reducing ells, tees, etc. In general, the use of the fittings shown will take care of most piping installations. Where pipe sizes reduce or increase a bushing or increaser can be used with a standard fitting.

Table III shows similar representative cast iron fittings. These are generally used for hot water and steam heating and for low and medium pressure steam supply and condensate lines. The union is employed in connecting together two solid runs of pipe or for connecting a line to a stationary appliance.

Installation of Fittings

When tightening or loosening a fitting it is important to use two pipe wrenches. One wrench should hold the pipe and prevent it from turning, while the other wrench should be used for turning the fitting. Sometimes a fitting is so tight that it cannot be removed from the pipe. If the fitting is cast iron it can usually be broken by hammering sharply on one side of the threaded boss while holding another hammer against the opposite side of the boss. Where the fitting is malleable iron or brass, the same procedure should be followed, but light blows should be employed and these directed at various points around the circumference of the threaded boss. This may loosen the thread, but if not, harder blows should be used in order to spread the metal and loosen the hold of the threads on the pipe threads. It is sometimes possible to break a malleable iron fitting in the same manner as a cast iron one.

In fitting pipe it is necessary to measure and cut to length accurately so that when the sections are fitted into place they will not throw a strain on the fittings or fixed connections and thus distort the threads and cause leaks.

Pipe Line Supports

It is also important to properly support piping in order to keep it from sagging and throwing strains on fittings and other connections. The supports should be spaced according to the size of the pipe. As a general rule, pipe to 4 in. in size should be supported at least every 10 ft. Where the line contains heavy fittings or valves the supports should be spaced closer, the spacing depending upon the number of joints and the weight of the line.

Pipe supports should be arranged to permit sufficient horizontal and vertical movement of the pipe to allow for expansion and contraction, and, it is well to line the supports with felt or some other soft material to deaden the sound in the event of vibration.

Small pipes may be supported by pipe straps, strap steel or regular hangers. Larger pipes are usually supported on regular hangers or on angle iron brackets. Vertical lines can be supported on floor collars, but it is important that the floors or steel beams supporting the collars have adequate strength to carry the extra weight of the pipe line. Where the weight is carried by base type fitting at the bottom of the line, the floor collars principally serve as guides to prevent sagging of the pipe.

In planning a piping installation it is important to calculate the necessary carrying capacity of each line in order to insure its delivery of the quantities desired. Carrying capacity of pipes depends upon the available pressure, the size and length of the pipe, and the number and type of valves or fittings in the line. For example, in a ½ in. water supply line a gate valve will offer as much resistance to the flow of water as will 4 in. of straight pipe; an ell creates almost as much resistance as 1 ft of pipe; a tee produces the equivalent resistance of nearly 2 ft of pipe; an angle valve offers as much resistance as 8 ft of pipe; and a globe valve produces the same resistance as 16 ft of pipe. The larger the pipe size the greater will be the resistance of valves and fittings as compared with straight pipe of the same size.

Protective Maintenance

Where possible, horizontal water pipes should be installed so that they will drain to the shut-off valve, where provision should be made for draining the water from the lines to prevent freezing if the danger of freezing exists. Where such an arrangement cannot be made, drain valves should be provided at all low level points. Hot water heating piping and some other types of pipe lines require similar provisions.

It is important that a piping job be carefully planned before any work is started. Then all pipe should be accurately measured, cut and threaded, and assembled tightly. The lines should be well supported, properly arranged, provided with protective valves where needed and insulated if necessary.

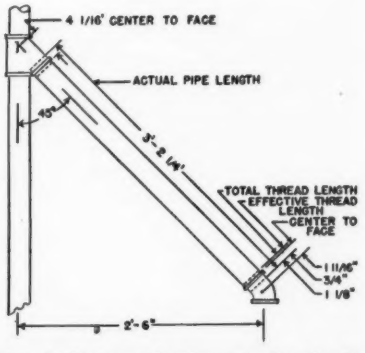


Fig. 4. Diagram showing actual center to center distance of the fittings at the ends of a 2 in. section of an angle pipe

Wooden Industrial Floors—

Their Installation and Upkeep

By GEORGE RANSOM, *Mechanical Engineer*

What are the woods most widely used for flooring and what are the qualities that make them desirable? . . . Proper methods of laying strip flooring . . . How to obtain the proper finish on a strip floor . . . How to maintain the finish . . . Qualities of end grain wood block flooring . . . Method of installation and adequate maintenance schedule to give better service

THERE are many good reasons why wooden floors are so widely used in industrial plants, but one of the most important is their resiliency, as a result of which the workers suffer less fatigue and are consequently more efficient. When properly maintained they provide a smooth surface for foot and wheel traffic, create a minimum of dust to get into machinery and products, and they wear well. When tools or parts are dropped on wooden floors they are not so likely to suffer serious damage and, in addition, wooden floors give good heat insulation so that they are warm and comfortable in winter.

The two most widely used wooden industrial flooring materials are strip maple and wood blocks set with the end grain up. Maple flooring manufacturers are also producing, and have laid in many large industrial areas, block flooring directly on concrete in mastic. They are found particularly in automobile plants, bakeries, etc. Oak, pecan, and some west-coast woods are used to a limited extent, and with good results, but northern hard maple strips and end grain southern yellow pine blocks are much more prevalent.

Northern hard maple, beech and birch are included in the classifications of the Maple Flooring Manufacturers Association, and possess physical properties nearly enough alike to permit of interchangeability in most instances so far as wearing qualities are concerned. The principal differences are that northern birch and beech have somewhat more color and grain than maple and consequently are used where certain decorative effects are desired, usually not important for industrial flooring.

These three woods have hard fibers, are close grained, do not sliver or splinter readily, and take a good polish under friction, which improves their wearing qualities. They all have unusual resistance to abrasion, especially maple, and when the surface is polished it is easy to keep clean. Northern hard maple heads the list from the standpoint of wearing qualities of all the untreated woods commonly used for industrial floors.

Of the three standard grades of maple, the first and second are very frequently used in industrial plants. In many cases the third grade does not hold up enough for heavy trucking and combinations of second grade and better plus third grade and better are used. Both second and third grades are called for in industrial specifications, the preference being for second and better grade. One reason why mixtures of second and third grades are frequently found economical is that they provide longer average lengths and avoid too great accumulations of one grade in certain sizes.

The Austin Company

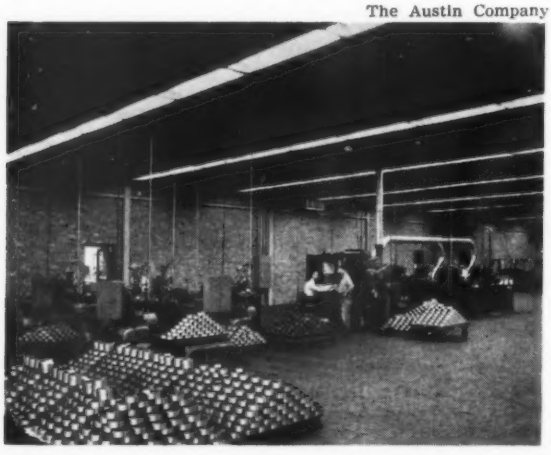


Fig. 1. Wood block floor has been installed in the semi-controlled section of General Electric's Tiffin plant

To secure the best results with strip finish flooring there should be a sub-floor made of thoroughly dry soft-wood boards not more than six inches wide, laid at an angle of 45 deg with the joists, as shown in Fig. 4. The arrangement should be such as to permit of having the strips in line with maximum travel over the surface. Waterproof building papers between the sub-floor and finish floor may be used if desired but it should be really waterproof so that it will not absorb moisture to be passed slowly on to the wood above and cause cupping of the strips. Waterproofing and good air circulation are all-important.

With new construction it is highly desirable to have the building as dry as possible before laying the floor. In addition, the flooring should be stored in the building, whether the latter is new or old, for at least three days before laying so that its moisture content will correspond to the normal atmospheric conditions in the building. It should never be placed tight against studding or walls but at least half an inch should be allowed for expansion.

When nailing, spiral or cut steel six or seven penny nails should be used for $^{25}/_{32}$ in. flooring, spaced not over 16 in. apart. They should be driven through the tongue at an angle of about 45 deg with the horizontal.

In many instances excellent results may be obtained by laying the new strip flooring over the existing floor provided the latter is not too badly damaged. Or the final flooring may be nailed to sleepers embedded in concrete 16 in. or less apart. In other instances the sub-floor may be laid on reinforced concrete in an asphalt binder, or its equivalent. For example, the U. S. Naval Ordnance Plant

Maple Flooring Mfrs. Assn.

Fig. 2. This view of the Chicago Towel Co.'s plant shows the Northern hard maple strip floor

Jennison-Wright Corp.

Fig. 3. There are more than 135,000 sq ft of wood block floors in the plant of Monarch Machine Tool Co.

in Indianapolis has over 500,000 sq ft of wooden flooring with a base of 6 in. of reinforced concrete, a 2-in thick sub-floor of hemlock laid in asphalt and a finish floor of strip maple $^{41}/_{32}$ in. thick, the strips being 2¼ in. wide. They are toe nailed to the sub-floor with case hardened twist nails.

A proper finish is of first importance for all industrial hardwood floors. In the first place they should be scraped or sanded so as to be smooth, with a final treatment with No. 00 sandpaper with the grain. After this comes sweeping or wiping until all particles of wood and dust have been removed. In industrial buildings, especially where the traffic and wear are heavy, it is recommended that a seal or preservative be applied which is moisture resistant and which has good penetrating qualities. A quick-drying vegetable oil seal may be used for this purpose which is then burnished with steel wool on the floor machine. This results in a glossy, non-slip, wear-resisting surface which is very easy to keep clean and otherwise in good condition. Such floors also have the best light reflecting properties.

Routine maintenance may then consist of going over the floor, as often as necessary, with a dry cloth mop. Thereafter the floor may be treated periodically, as conditions require, with a surface renewer which is burnished with a cylinder of steel wool on the floor machine. This should be done frequently enough to prevent incrustations of dirt and oil on the floor which will require repetition of the heavy abrasive cleaning used as a first step in putting the floor in good condition. For the best results it is desirable to arrange the machinery so that the aisles extend along the length of the strips. Modern floor machines will work to within a few inches of walls and machines, leaving a minimum of space which must be treated by manual methods.

This method of dry cleaning is strongly recommended for all wooden strip floors. In fact, some authorities feel that the effect of scrubbing with water and cleaning compounds is harmful and should be discouraged wherever practicable. Wet cleaning softens the wood fibers so that they are weakened and crushed by passing traffic. The wood is then likely to become warped, splintered and roughened. While wet, the floors are liable to be slippery and result in accidents, water may splash on goods in process of manufacture and drip down to the floor below, causing damage. In other words the modern method of dry cleaning wood floors with the help of up-to-date floor machines is highly preferable to scrubbing with a wet process.

Floor Maintenance

According to government statistics some 120,000,000 sq ft of end grain wood block flooring was installed during the six war years from 1940 to 1945, inclusive. While very large areas of such flooring were installed prior to that period and since, this figure gives a good idea of how rapidly it is expanding. Ford's Willow Run Bomber Plant, built in 1942, had around two and a half million square feet.

End grain wood block flooring possesses about all of the advantages enjoyed by wood flooring in general, as already enumerated. However, this type of flooring is especially suitable for heavy duty and from that angle has certain additional advantages. For example, heavy blows and the abrasion from heavy traffic tend to mat down the end fibers without splintering. It also permits the easy installation of sub-floor electrical conduit, and lends itself readily to the fastening of machinery to the floor. Alterations and patching are easily accomplished with such floors. It has also been found that creosoted end grain wood blocks laid on concrete foundations are practically fireproof. Fires built on such floors die out and merely char the blocks. For instance, such floors suffer no serious damage in gray iron and aluminum foundries where they are constantly splattered with molten metal.

As explained by Lambert T. Ericson, chief engineer of one of the largest makers of wood block flooring, blocks 2 to 4 in. thick are cut from thoroughly seasoned southern yellow pine timbers three by six to eight inches, or four by six to eight inches, in cross-section. They are treated with creosote by a vacuum and pressure process which gives them a thorough impregnation of preservative, and also makes them highly durable and sanitary. Douglas fir and upland oak also are employed but southern yellow pine is by far the most widely used.

The method of installation of the wood blocks and their proper maintenance are extremely important. About 98 per cent of all industrial wood block floors are laid on a smooth concrete foundation which has been covered with coal tar pitch. After the blocks are in place they are flushed with hot coal tar pitch to fill the spaces between them, and to waterproof the surface.

It should be realized that the volume of wood blocks changes constantly due to variations in their moisture content according to fluctuation of atmospheric humidity, if nothing else. Of course, the manufacturing processes carried on and the methods of cleaning the floors have a great deal to do with variations in the moisture content of the blocks and the amount of expansion and contraction which they undergo.

Consequently, care must be exer-

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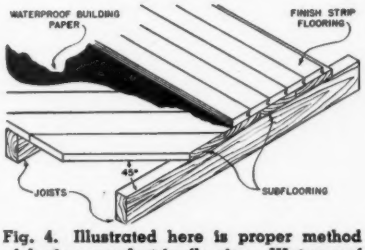


Fig. 4. Illustrated here is proper method of laying wood strip flooring. Waterproof paper prevents absorption of moisture by finish strip flooring

HOW TO WELD AND USE Brass and Copper Pipe

Low silicon bronze welding rod and gas welding yield strong corrosion proof joints . . . Brazed, square copper tube bus give high current capacity which can be increased 20 per cent by ventilating holes . . . Cover plates for angle and tee connections

By J. J. VREELAND,
Chase Brass & Copper Co.

COPPER AND RED BRASS[1] have been used for years as an economical piping material to combat corrosion and to insure long service. The joining of these materials was done by the use of threaded joints employing heavy threaded cast fittings, which at times presented a problem to obtain leak-proof connections. The use of solder sweat type fittings was made to minimize installation costs but these could only be used on relatively low pressure systems with operating temperatures below 212 F. This type fitting did not prove practical for pipe sizes in excess of 6 in.

Advancement in the art of welding soon brought forth the joining of these materials using a yellow bronze welding rod and the oxyacetylene torch. This method has been called bronze welding and was quite satisfactory from a structural strength standpoint. The yellow bronze point so made contained a high percentage of zinc and was subject to premature failures due to dezincification of the joint by the corrosive properties of the liquid being piped.

This has been overcome by the use of a welding rod which yields a deposit not subject to this type of failure. The joining operation is a welding operation whereby fusion of the base metal occurs with the molten filler metal using the oxyacetylene method of welding.

For the joining of the copper pipe or tube lines, a silicon copper welding rod containing 0.35 per cent silicon and the balance copper, is recommended. This rod will permit the welding of copper in any position with strengths in the joint equal to 90 per cent of the minimum tensile strength of the annealed copper pipe (30.000 psi) and ductility values in excess of 40 per cent measured by a free bend method. Low cost joining cannot be realized, however, because of the high thermal conductivity of the copper.

Red brass, because of its lower thermal conductivity, can be joined at a much lower cost, and, since it possesses equal corrosion resistance to copper, should be first choice for piping problems. The use of a low silicon bronze welding rod[2] makes the joining of the pipe more economical. It also yields joints equal in corrosion resistance to the pipe and the strength of reinforced joints exceeding the tensile strength of the pipe.

Non-reinforced welded test samples indicated that a minimum tensile strength of 90 per cent of the 40,000 psi minimum tensile strength of the base metal can be expected at all times. Ductility values are slightly in excess of 40 per cent measured by a free bend test.

The method of joining red brass pipe has been successfully and economically used for the installation of the piping in the Criminal Courts Building, New York City, and for acid sludge lines in oil refineries. A most recent application was the installation of a 5-in. condensate return and a 2-in. trap discharge in the extension of a central heating system at the University of Pittsburgh, Pittsburgh, Pa. The condensate line was designed for 125 lb operating pressure.

Figure 1 illustrates the oxyacetylene welding of the 5 in. condensate and the 2 in. trap discharge. The 5 in. condensate lines required an auxiliary torch to maintain proper temperatures for welding. Figure 2 shows the completed joints. Both brass pipe lines are encased in special 15 in. insulated Ric-wil conduit. The conduits are laid on a concrete base and extend between underground concrete vaults located at right angle turns and at regular intervals to provide easy access to expansion joints, crossover connections and trap connections.

Figures 3 and 6 show the brass piping in two of these vaults showing welds made in various positions and the use of long sweeping bends to allow for expansion and contraction. The red brass pipe can be bent cold into long radius 90 deg bends, or, welding elbows ready for use can be obtained. Tees and other fittings can

[1] Composition: 85 per cent copper and 15 per cent zinc.

[2] Composition: 1.5 per cent silicon, 1 per cent zinc and the balance copper.

Fig. 1. Below: Oxyacetylene welding a 5 in. red brass condensate pipe. The auxiliary torch is required to maintain proper welding temperature

Fig. 5. Below: A welded 5 in. red brass condensate pipe and 2 in. discharge pipe. Brass pipes are encased in 15 in. insulated conduit

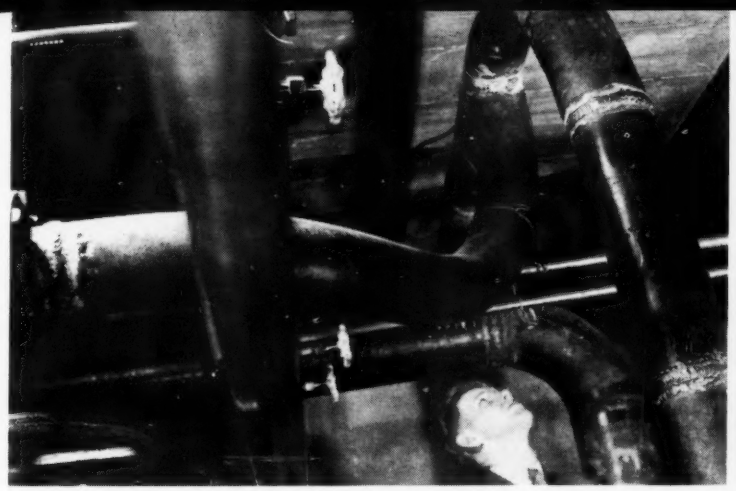


Fig. 3. Another view of the 5 and 2 in. red brass condensate and trap discharge pipes showing the oxyacetylene welded joints

Fig. 6. A 5 in. and 2 in. red brass condensate and discharge pipes in underground vaults

very easily be made in the shop from the brass pipe.

Large diameter process piping lines are being prefabricated for economy and ease of installation. These large tubes and fittings are fabricated from copper silicon alloy sheet and the carbon arc welding method. The alloy used is equal to copper for corrosion resistance and lends itself to carbon arc welding which minimizes cost of fabrication.

Thicknesses normally used to maintain rigidity in the line and to minimize material cost and labor, are sufficient to withstand 300 psi test pressure without distortion. Flanged connections of a two piece Vanstone type are used. Figure 7 illustrates a large diameter piping installation.

Another product, tubular in form but not used for piping, is being used more in the power field for various reasons, but, one of real importance is the ease of assembly by joining in the field using modern brazing methods. Square copper tube buses, which are furnished both ventilated and unventilated, incorporate practically all of the essential properties of an efficient bus conductor.

They have high current carrying capacities, great mechanical strength

(Continued on page 37)

Fig. 7. Right: A 14 in. diam. carbon arc welded pipe and fittings installed in a Venturi meter system operating at 100 psi. Fabricated from copper silicon alloy sheet

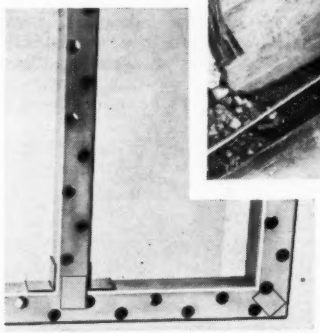
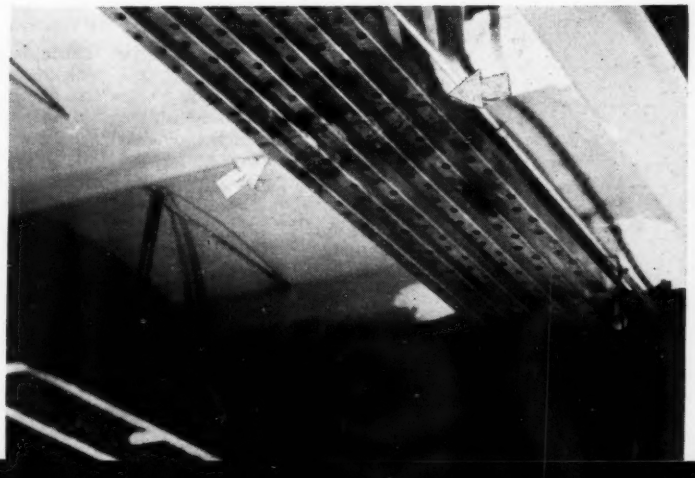


Fig. 5. Sample illustrating type of joints for right angle and tee connections using cover plates

Fig. 8. Below: Brazing a square tubular copper bus with the oxyacetylene torch

Fig. 4. Below: Completed square tubular copper bus showing joints brazed with cover plates



Organic Solvents—

The Right Way to Handle Them

By LILLIAN GORDON

Safety Research Institute

ORGANIC SOLVENTS are among those chemicals which require careful handling if accidents, such as fire and industrial illness, are to be avoided. There are very few plants which do not employ one or more solvents, either for regular degreasing operations or for occasional cleaning, wiping, thinning, etc. Whether it be in tanks, drums, cans or bottles, a careful investigation would probably show the presence of some organic solvent in the great majority of plants, large or small. Benzine, gasoline, naphtha, carbon tetrachloride, acetone, are among those most commonly found.

In plants using a large-scale solvent operation, the need for observing safe handling rules is generally understood. As a result these plants generally employ large volumes of solvents without accident. Unfortunately, the same cannot be said for those plants which use solvents only incidentally or in small volume. Here there is often the mistaken belief that since the liquid is used occasionally, or for a short period of time, there is no necessity to observe careful handling procedures. It is not surprising, therefore, to find that most accidents involving solvents occur in just such small or occasional applications of solvent.

The characteristic properties of organic solvents that is, their volatility and solvent power, are also the properties which may give rise to hazard. Because the liquid evaporates readily, any open container of solvent or any solvent-wet article in the workroom will soon contaminate the air with solvent vapor unless provision is made to remove the paper. While a small amount of vapor in the workroom air is harmless, larger amounts may give rise to discomfort, illness, or even death. The amount of vapor of any given solvent which it is "safe" to inhale depends upon the length of time the individual is exposed. Thus, there is a "safe limit" (which is really an approximation) for continuous exposure to various solvent vapors, eight hours a day every day.

While more than this amount may be inhaled briefly without danger, prolonged breathing of larger amounts may result in more or less severe symptoms of solvent illness. For example, there may be vague symptoms such as headache, dizziness, nausea, which may at first be ignored. If exposure continues, injury to various internal organs of the body, such as the liver, kidneys, blood, or nervous system, is likely to result. When the exposure is more severe, symptoms such as stomach upset may occur within a few hours, followed by injury to various organs of the body. When the concentration of the solvent vapor in the air is sufficiently high, the vapor may act as a narcotic unconsciousness and death if removal to solvent-free air is not prompt.

The solvent power of these liquids also makes them a potential source of dermatitis, the most widespread of industrial illness. Prolonged or repeated contact of the solvent with the skin will cause drying and cracking, and infection may follow.

Another hazard associated with the careless use of most solvents is fire. The only nonflammable solvents are the chlorinated liquids, carbon tetrachloride, trichlorethylene and perchlorethylene. The flammability of each solvent is a function of its ignition temperature, flash point, volatility and related properties. The Underwriters' Laboratories has classified solvents according to their "flammability rating." Those with ratings above 40 are serious fire hazards.

The following are important points to be considered in planning for safety in the use of organic solvents:

1. Survey of the Solvent Hazard

The plant should be thoroughly surveyed, to determine which solvents are used, and where. This should include not only all regular operations, but such incidental procedures as the overhauling of machinery, cleaning of equipment and transfer of solvent from larger to smaller containers. The fire or health hazard

Fig. 1. This type of respirator provides oxygen for the men to breathe, a necessary provision where solvent vapors are concentrated as in tank cleaning

It is generally the small amounts of solvents, wrongly used, that cause most of the solvent sickness, explosions and fires . . . Safety program for the handling of solvents encompasses many points from a survey of the solvent hazard in our plant through an educational program for employes . . . Where flammable solvents are used special fire safety precautions must be observed . . . Correct respirator use near solvent vapors

which may be associated with each use of solvent should be carefully studied.

2. Reducing the Fire Hazard

Where flammable solvents are used, special fire safety precautions must be observed. Large-scale users of flammable solvents follow these rules which may also be a useful indication to those employing small quantities of flammable liquids:

1. All flames, smoking, etc., are eliminated.
2. All sources of sparks are removed. Rubber-soled shoes are used and fan blades and tools are made of nonferrous materials.
3. In spray booths, the booth, floor baffles and all other parts of the system are constructed of fire-resistant materials.
4. Surfaces of walls should be smooth to facilitate routine cleaning.
5. All electric lights, wiring and other electrical equipment meet the requirements of the National Electric Code.
6. All equipment for handling flammable solvents, including funnels and portable containers when the latter are being filled or emptied, are electrically grounded.
7. Main supplies of solvents are stored in a fireproof storage building, and all mixing is done in this building.
8. Provision is made for rapid extinguishment of fire, and for notification of the public fire department.

3. Avoiding the Inhalation of Solvent Vapors

The best means of preventing the inhalation of solvent vapors is the use of entirely enclosed equipment. There is also partially enclosed equipment for degreasing operations which provides for condensation of solvent vapors before they can escape into the workhoom atmosphere. Smaller solvent operations can be carried out under a hooded exhaust, which can be partly enclosed so that only the worker's hands need enter the solvent atmosphere.

Since solvent vapors are generally heavier than air, there are many instances where local down-draft ventilation is the most practical means of removing solvent vapors. A ventilated work table with lateral exhausts, for example, can be useful in cleaning small parts.

In some plants, the most effective method to prevent inhalation of solvent vapors may be to set aside one small especially ventilated room which can be isolated from the general workshop for operations requiring the use of solvents. Or it may be feasible to utilize a portable blower, which operates as an exhaust unit, catching solvent vapors at their point of origin and carrying them outside the workroom to be expelled. A blower or suction unit of this type usually has a wheeled base and is equipped with large-diameter flexible tubes to act as ducts. If the unit is of a type which can be equipped with two intakes, one should be placed as near the work as possible, and the other at about six inches above the floor level, directly beneath the work, in order to catch falling vapors.

While localized ventilation is usually the best procedure, very small solvent operations may sometimes be carried out safely in a room equipped with good general ventilation. However, in such cases there is the danger that the concentration of vapor in the breathing area of the worker may be too high, even if the average concentration in the room is safe. If open windows are relied upon for ventilation, the closing of windows in the winter time, or the reduction of ventilation on a still day, may result in hazardous build-up of vapors.

There are instances where the work may be taken outdoors and done safely, if care is taken to arrange procedure so that the vapors are blown away from the workers. Flammable solvents are most safely used when the air is humid, to reduce the chances of static electricity. Nonflammable solvents, on the other hand, are best used on a dry, breezy day.

Respirators may also be used to avoid the inhalation of solvent vapors. They should not be employed as a substitute for good procedure, but may be helpful in many special instances of solvent application, such as operations requiring only intermittent use of solvent. They are of particular importance where the worker must be exposed to high concentrations of solvent, as in cleaning a tank or other piece of equipment which has contained solvents.

There are three types of respi-

Fig. 2. A closed type of conveyor protects the worker from exposure to solvent vapors. The conveyor carries the cylinder heads into and out of the solvent; fans within the machine exhaust injurious fumes while special gloves protect the worker from possible skin irritations

rators: the canister type, or "gas mask," which filters the solvent vapors from the air through a canister; the "supplied-air" type, which supplies air from an outside source through a hose line; and the "self-contained" type, which carries its own oxygen supply.

In using the gas mask, it is important that the filtering substance in the canister be of the proper type to remove organic vapors, and that the canister be replaced as soon as its filtering power becomes doubtful. This type of respirator cannot be used where the vapor concentration in the air is above 2 per cent.

If the concentration of vapor is high, it is advisable to use a supplied-air respirator. The one-inch hose on this equipment carries air from an uncontaminated area on the outside, and if the hose is longer than 25 ft a manually operated blower should be provided.

In some operations, such as spray painting, a source of compressed air may be available. This may be used to supply the respirator through a small diameter (½-in.) hose. Since there is danger of failure of the compressed air supply, these respirators are unsafe to use where rapid escape is not possible, as in tank cleaning.

The well-known type of self-contained respirator, which carries its own supply of oxygen, is quite cumbersome and should be used only by men trained in the proper technique. Newer respirators supply oxygen by means of a chemical reaction which occurs while the wearer breathes. These are less cumbersome and easier to wear.

Whatever the type of respirator chosen, it is important to make certain that it is approved for the specific type of job by the U. S. Bureau of Mines.

4. Protecting the Skin Against Dermatitis

Where there is an enclosed solvent process, there is little likelihood of skin difficulties. However, in such operations as hand dipping or wiping, or in filling solvent containers, special care must be taken to avoid repeated contact of the solvent with the skin. Solvent-resistant gloves and aprons are available (suppliers should be told what solvents are in use, so that garments of suitable materials can be selected). Clothing wet with solvent should always be immediately removed and dried where the vapor will be safely removed. There are also protective creams which may be of help in minimizing dermatitis.

A most important item in preventing skin difficulties is personal cleanliness. Adequate washing facilities, with effective but not harsh cleansing agents, plus a supply of lanoline cream to prevent skin dryness, can do much toward eliminating skin difficulties in any plant.

5. Preventing Accidents from Unauthorized Solvent Use

Frequently, even in a well supervised plant, accidents will occur because of some unauthorized use of solvents. Employes may use solvent to remove dirt from clothing or to clean up working quarters, with no regard for the hazards involved. In one instance, a worker observed that the organic solvent used in a nearby machine was doing an effective job of dissolving grease. He decided to use it to clean up grease on and around his work bench. Of course, the protective devices used to prevent vapor escape from the machine did him little good in his unappointed job, with the result that he came down with a fairly serious case of solvent illness.

To prevent accidents from unauthorized solvent use, it is often expedient to have some control over the distribution of these liquids. Some plants have a central distribution point and use a requisitioning procedure. If the requisition form contains a statement of the purpose for which the solvent is needed, misuse of solvents can be avoided. In addition, a periodic check of requisitions can be used to locate those operations which employ relatively large quantities of solvents, and which therefore should receive special attention with regard to safety.

6. Storage and Labeling of Solvents

Whatever the amount of solvent involved, correct storage and labeling are important factors in avoiding accident. All solvents should be kept in closed metal containers. Flammable solvents should be kept in safety cans which are stored outdoors or in a fireproof place. Even small amounts of solvent should be kept in self-closing containers wherever possible.

Manufacturers of solvents are careful to label their solvents with the necessary precautionary information. The man actually working with the solvent should have this information before him. It is therefore essential that whenever a solvent is transferred from the original containers the new container should bear a label with this same data on it.

7. Medical Protection of Employees

Where large-scale solvent operations are in use, many plants have found it advisable to institute a thorough medical program, including preemployment examinations and regular medical check-ups. The susceptibility of individuals to solvents may vary. Certain individuals may become ill from solvent vapor concentrations which are normally safe. For example, obese individuals, alcoholics, and those with certain organic difficulties may be readily affected by solvent vapors. Medical examinations can sometimes discover these sensitive individuals before they are exposed to solvents. In addition, examinations are important because the early discovery of solvent illness or dermatitis may prevent more serious developments.

While the small solvent user may not find such a thorough medical program feasible, some attention to medical protection should be given. Persons known to be suffering from some disability, such as diabetes, heart, liver or kidney trouble, should not be assigned to jobs that require handling of solvents. Also, since drinking sizable amounts of alcohol may render otherwise healthy individuals unusually susceptible to solvents, workers who show sign of too much celebration should not be given jobs which will require the use of solvents.

Provision should be made for prompt medical attention in cases of solvent accidents. Any indications of possible solvent illness (dizziness, headache, skin irritation, stomach upset, etc.) should be promptly checked by a physician.

8. Education of Employees

The large-scale solvent user generally depends upon engineering controls, such as well designed equipment and mechanical ventilation, to provide protection from solvent hazards. Nevertheless, he recognizes that his employes must be trained to be alert to possible equipment failure, and to participate actively in the safety program.

The necessity for employe education is even more important where only small or incidental use of solvents is involved. Here, the way the employe himself handles the solvent is often the determining factor in insuring his safety. Employes should be cautioned against careless sloshing and spilling of solvent. Emphasis should be placed on the need for keeping all containers covered and on avoiding poor practices which will result in vapor inhalation (such as bending over the work, dipping hands in solvent, etc.).

The large solvent user is likely to have a safety staff with a safety engineer or industrial hygienist in charge, so that the safety program can be well planned and coordinated.

In the small plant, or where employment of solvent is not a regular or large-scale procedure, it may be helpful to obtain the necessary guidance from one of the governmental industrial hygiene agencies. Assistance is available from the U. S. Public Health Service, various State bureaus of industrial hygiene, and a number of city industrial hygiene agencies. These agencies provide free assistance in surveying plant hazards and checking on safety procedures. Manufacturers also can be helpful in advising on safe procedures for their own products.

Selection, Installation and Care of

Electric Water Coolers

Uses of various types of coolers . . . How to figure capacity of coolers and necessary capacity for various numbers of workers in different types of industries . . . Correct placement of coolers . . . Introduction of saline solution to potable water supply, especially in hot, heavy industries . . . Special types of water coolers and where to apply . . . Standard methods of cleaning fountains

Fig. 1. The modern electric water cooler is convenient to install, service and maintain and renders a sanitary service far better than its old fashioned predecessors

THE COMMON drinking cup and the inverted water faucet fountain have disappeared in the modern manufacturing plant. They were helped out of the picture by the development of the electric water cooler and by managements' growing realization of the value of high industrial sanitation standards. The primary function of a drinking fountain, of course, is to provide pure drinking water. But, in this case, the by-product dividends—increased worker health, morale, increased production —are as valuable as the performance of the primary task.

First, let us consider the various types of fountain which are available for use in industrial establishments, department stores, hotels, office building and hospitals. The four general types are the bottle type, bubbler type, central system and cafeteria type coolers. (See Fig 2.) Two special type coolers will be discussed later in the article.

The bottle type was developed and is recommended for use where small groups of people are to be served. It has a number of distinct advantages such as the ability to utilize spring water and other specially bottled waters. No plumbing connections are necessary and the coolers are portable so they can be set up anywhere within reach of an electric outlet.

The bubbler type, available in a wide capacity range, is adaptable to any location where city water and drain connections are available. Central systems, such as the one shown in the drawing, Fig. 5, employ a centrally located refrigeration unit, connected to the municipal water supply. The cafeteria type cooler fulfills modern requirements for the drinking water supply in employe cafeterias where there are many users with individual glasses.

In order to arrive at the correct capacity and number of coolers the plant engineer has many previous studies to guide him. The amount of water that each person drinks and the temperature at which he should drink it varies with the individual's occupation, personal likes and dislikes, his activity and rate of movement, and the temperature of the surrounding air. It has been necessary, however, when planning industrial installations of drinking fountains and water cooling systems, to arrive at a standard amount and a standard temperature of water dependent upon the type of industry. Table I shows drinking water requirements for various types of industries and establishments.

Studies have also shown that it is wise to have coolers so placed that

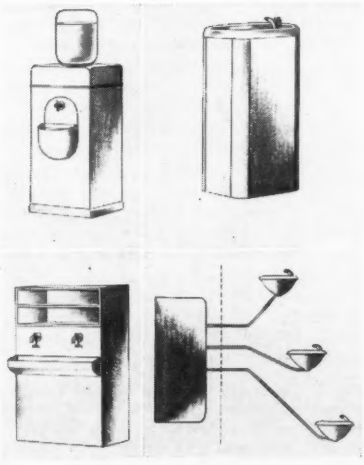


Fig. 2. Right: Illustrated here are the four basic types of electric water coolers: bottle type, bubbler type, cafeteria type and central system type

workers do not have to walk more than 100 ft, at a maximum, to obtain a drink of water. Many recent installations have cut this figure down to 50 ft. An example of this is shown in the plant of Ranco, Inc., Columbus, Ohio, where more than 600 people are employed. Ranco has installed fourteen ten-gallon bubbler type coolers scattered throughout the buildings from lobby and offices to assembly lines and cafeteria. The floor plan and the location of these coolers are shown in Fig. 4.

Salt Requirements

It will be noted, by reference to Table I, that workers in hot, heavy industries such as steel plants and iron foundries, consume on the average of 1 quart of water per hour. This means that a terrific amount of salt is being dissipated through the pores of the skin. To overcome this loss the generally accepted practice has been to make available to the workers salt tablets in a dispensing machine located near the water coolers. Many of these tablets contained a sugar intended to cut down on the number of cases of nausea which are caused by the tablets. However, this proved to be dangerous to workers afflicted with diabetes. Saline water is now being used effectively in some plants.

The Inland Steel Co., near Chicago, circulated salinized drinking water through its two Indiana Harbor plants. This method of treatment has reduced both the severity and number of heat sickness cases tremendously, according to reports issued recently by Dr. Edward H. Carleton, director of Inland's medical department. Beginning with the first warm days of April or May, salt is added to the water which flows to the plants' 285 refrigerated water coolers and other auxiliary drinking sources which serve some 14,500 workers. The drawing, Fig. 7, shows the manner in which salt is introduced to the water.

"Lost manpower due to heat sickness has dropped from as high as 288 man days in the years when only salt tablets were offered, down to less than 25 a year," Dr. Carleton stated. "In 1940, when only tablets were available to workers, we had 144 cases of heat sickness. Several were severe and the amount of time lost from work averaged about two days."

In 1941 the company installed a salinizer in one of its plants and today, possibly, Inland has the only plantwide system of its kind. A salinizer was installed in the second plant in 1943 and that year the number of heat sickness cases dropped to 61. This rate of decrease continued until the present time; in 1947 there were only 33 cases of heat sickness.

Table 1. General data on requirements for various types of industries

Type of Service	Delivered Water Temperature Deg F	Gallons Per Hour Per Person	Waste and Consumption Per Person Per Hour oz. Liq	Consumption Only Per Person Per Hour oz. Liq	People Served Per Gal
Office:					
Cup	45 to 50	0.033	4.2	4.2	30
Bubbler	45 to 50	0.083	10.5	4.2	12
Lt. Manufacturing	45 to 50	0.143	18.3	7.32	7
Hvy. Manufacturing	50 to 55	0.20	25.6	10.24	5
Hot Heavy Mfg	55 to 60	0.25	32.0	12.8	4
Restaurant*	40 to 45	0.1			
Cafeteria*	40 to 45	0.083			
Schools	45 to 50	Same as Office			
Hospitals:					
A	45 to 50	0.083 gph per bed			
B	45 to 50	0.083 gph per attendant			
Hotels	45 to 50	0.08 gph per room			
Dept. Stores, Hotel, Office Building Lobbies	45 to 50	4 to 5 gph per fountain			

*Special consideration should be given to peak load demands.

Salt Concentration

This salinizer, developed by Inland, injects a salt brine into the water main much in the same manner as chlorine is injected. The company strives to maintain a 0.09 per cent concentration of salt which is about the same concentration as found in human blood and tissue. When the drinking water is cooled to about 50 F the salt taste is not discernible.

Special types of water coolers are available where hazardous conditions — such as explosion dangers — exist. Freeze-proof coolers also may be had for installation in exposed locations. The explosion proof type is specifically designed for use in hazardous atmospheres such as air which contains gasoline vapors or combustible dust. Only equipment which has been tested and approved by Underwriters' Laboratories for installation in hazardous locations should be accepted. The Underwriters' label will indicate the type of atmosphere for which the cooler is suited. Sealed condensing units and water-cooled condensers are used in explosion-proof water coolers. Even when belts have been specially treated and grounded the use of open type belt-driven units can not be approved. Rigid steel conduit with explosion-proof fittings and disconnected switch, also listed by Underwriters' Laboratories, should be used to house the power supply wiring to explosion-proof water coolers.

Freeze-proof water coolers are generally standard design units which have been modified to some extent to

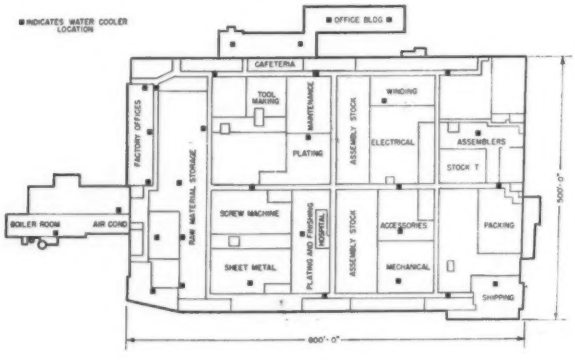


Fig. 3. Thirty-two pressure bubbler type water coolers are spotted strategically throughout this typical assembly plant which covers 400,000 sq ft and employs 2,500 workers. In addition there is a cafeteria type water cooler in the plant cafeteria

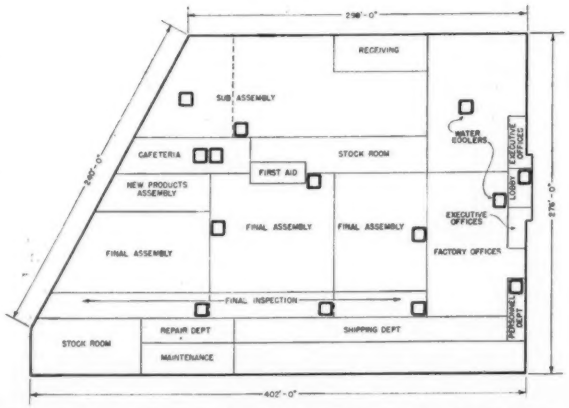


Fig. 4. There are more than 600 employes and not one has to walk more than 50 ft in this typical small manufacturing plant. There are 14 10-gal bubbler type water coolers installed here

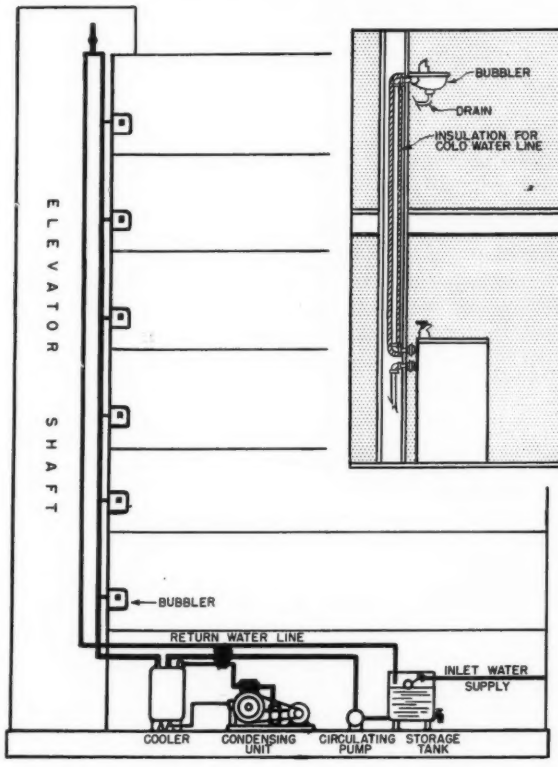


Fig. 5. The six floors of this building are served by a circulating refrigerated water system. While this sketch, for simplicity, shows but one cooler per floor, large buildings or stores install several coolers on each floor, all connected to the same circulating system. Fig. 6. Shaded inset: This drawing shows the method of hooking-up a bubbler on the second floor of a two-story building when there is no central refrigerating system as there is in Fig. 5. Note the method of insulating the cold water line

permit them to operate at temperatures below 32 F. Usually these modifications consist of a cabinet which has been insulated and an electric heater, thermostatically controlled, located in a central position (in relation to the water-carrying parts) so as to protect all water-carrying pipe, valves and fittings.

Sometimes it is desirable to put a second bubbler a short distance from the electric water cooler. This distance should not exceed 20 ft and even 15 ft is better due to the heat loss through the insulating jacket on the ice-water line. A typical installation of this type is shown in Fig. 6.

The necessity for a high standard of sanitation has been recognized by the industry and has been set down in its Commercial Standard CS 127-45. The section of the Standard dealing with retail requirements governs the type of materials which make up the bowl, the fountain jet, the fountain guard; it regulates the height of the jet above the edge of the bowl, the angle of water stream issuing from the jet, the shape of the bowl, the height of the fountain and the drinking level, and the size of the waste opening.

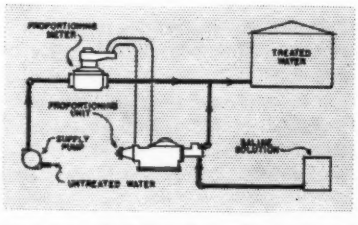


Fig. 7. A hook-up along these general lines is used at Inland Steel Co. plants to introduce a saline solution to the drinking water

The importance of taking advantage of these built-in sanitary precautions has been recognized by nearly every plant engineering and sanitation department. In fact, the Industrial Sanitation Research Foundation has laid out a standard cleaning method for both drinking fountains and for water bottle coolers.

Standard Methods of Cleaning Coolers

The standard method for cleaning water coolers is: 1. Prepare a solution of an alkaline powder detergent. 2. Wet cloth in solution and wash drinking fountain. 3. Sponge with clean water. 4. Remove any remaining stains with paste cleaner; for stubborn stains use a paste rust remover. 5. Clean the small drain holes with a 6 in. separator brush. Before disinfecting, rinse the drinking fountain thoroughly with water. 6. Wet cloth with liquid disinfectant solution. If sprayers are available spray the fountain with the disinfectant and omit steps 7 and 8. Wipe the fountain with the cloth. 8. Permit the solution to remain in contact with the surface for at least 5 minutes before the fountain is used. Clean and polish metal fixtures and attachments.

The prescribed routine for the cleaning of water bottle coolers is as follows: 1. Empty water out of bottle and drain cooling coils. 2. Add 1 gal solution of powdered alkaline detergent to the water bottle. 3. Scrub interior of bottle with brush. 4. Rinse bottle with clear, uncontaminated water. 5. Add 1 gal liquid disinfectant solution to water bottle, wetting all sides of bottle with solution. 6. Drain liquid disinfectant solution through cooling coils. 7. Rinse water bottle and cooling coils with clear, uncontaminated water. 8. Once a week let warm solution of alkaline cleaner stand in coils for 15 minutes. Drain, rinse and follow procedure as above.

Wooden Industrial Floors

(Continued from page 23)

cised in this regard. The method of installation does this and the latest practice provides for a uniform open joint construction by which expansion of the blocks is absorbed by compression of lugs. This open construction also makes it possible for the filling compound to penetrate to the bottom of all sides of every block so as to seal them completely. The filler used is an emulsified coal tar product which is waterproof, oil resistant, non-softening at high room temperature and is not sticky.

Continuous adequate maintenance is essential for satisfactory performance. As Mr. Ericson has pointed out, the long period during which a floor may not be so bad that it forces attention but nevertheless is in poor enough condition to impair the efficiency of plant operations, is likely to be costly. During such periods there are sure to be losses in production, avoidable worker fatigue with resulting losses and accidents. Maintenance routines should therefore contemplate continuous upkeep of the floors.

Selection of cleaning methods is equally important. The one recommended for wood block construction includes, first, dry cleaning with a floor machine and No. 30 gage wire brush to remove accumulations of grease and other incrusted materials. This may be followed by scrubbing with one of the electric floor machines having vacuum water pick-up. The idea of this combination of dry and wet cleaning, which has been in successful use for several years in numerous industrial plants, including those of the Ford Motor Co., is that the wet cleaning reduces dust and helps to keep the blocks from undue shrinkage because of excessive drying out. The fact that the blocks are impregnated with preservative and that only the end grain is exposed removes the objection to wet cleaning which applies to strip maple flooring.

HOW TO MAINTAIN MOTORS and GENERATORS

Part IV. How to clean, true and polish the commutator . . . Proper use of the dressing stone . . . Selecting and servicing brushes . . . Cleaning brush holders . . . How to set brushes on neutral and space on commutator . . . The right and wrong way to stagger brushholders . . . Examples of bad brush operation . . . How to set brushes at correct angle for service

By C. G. GRANT, *Motor Division, General Electric Co., Schenectady, N. Y.*

TO CLEAN A COMMUTATOR properly use a piece of dry canvas, or other hard non-linting material, wound around and securely fastened to a wooden stick and held against the commutator. Do not use a lubricant on the commutator either during or after the polishing period. If the commutator is clean and polished and the brushes have a perfect fit the unit may be loaded at once provided the insulation resistance is satisfactory. If the commutator is not polished the machine should be run with a light load for several hours in order to establish a high and uniform

Fig. 1. For cleaning fasten a piece of dry canvas to a stick and hold it against the commutator

polish on the commutator surface and a good fit on the brush faces. Brushes can be fitted more quickly if the machine is carrying a load in proportion to the percentage of contact surface of the brushes. As the brush fit improves the load can be increased depending on the amount of sparking and heating.

To tune up the commutator proceed in the following steps:

Step 1. Undercut the mica. A square slot is preferable provided slots are accessible to easy cleaning. Where slots are likely to collect dirt as in low-speed machines or in a dirty atmosphere the V-shaped slot may be more satisfactory. It is well to bevel the segment corners slightly. Various types of undercutting tools are available and some of these are shown by Fig. 2.

Step 2. Polish the commutator. Several varieties of dressing stones are available on the market. These stones may be held in the hands or mounted in adjustable rests as shown by Fig. 3. When stoning, the brushes should be lifted away from the commutator and the generator should be driven at normal speed by the prime mover or a motor, by mechanical power from external source if this is possible. Before stoning all traces of oil or grease should be removed from the commutator and stone. The stone should be worked from end to end of the commutator, and the surface ground down evenly. After stoning, the commutator should be smoothed with a very fine grade of sandpaper and then polished by using the back of the paper.

Step 3. Clean. After the commutator has been conditioned make sure that it is completely cleaned out with every trace of copper, carbon, or other dust removed preferably by means of a suction.

Step 4. Reinstall the brushes. Do this carefully and seat them by applying a small amount of seating compound to the commutator. After seating again clean the commutator thoroughly.

When the commutator is too rough or eccentric to be stoned down successfully by hand, the stone can be held by a pair of clamps in a tool post. However, better results can be obtained by the use of a revolving-wheel grinder, or, it may be advisable to turn the commutator in a lathe. When extreme roughness exists, it is probably better to send the armature to a reputable service shop. For extreme commutator roughness, turning of the commutator in a lathe is suggested.

Brushes

Successful brush operation depends, to a large extent, upon the selection of the brush most suitable for the service requirements. Experience with various types of brushes is undoubtedly the best criterion in their selection. Manufacturers of electric machinery should be consulted, whenever possible, before a change from the original brush equipment is made. Rapid wear is not uncommon in the

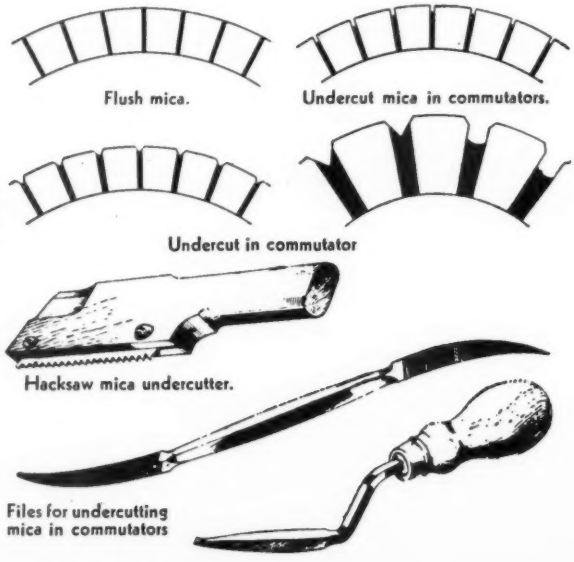


Fig. 2. Methods and tools for undercutting mica. The square cut is preferable but the V-slot is easier to keep clean

early stages of operation. Abrasion from dust, rough commutator, high commutator bars, high mica, and excessive pressures may occur.

Different kinds of brushes are available for different atmospheric conditions. Graphite brushes are most widely used because of their lubricating qualities.

However, some of them have little abrasive ability, and these require care in operation. Brushes must have sufficient cross-sectional area and be of sufficient number to carry the maximum current of the machine.

Brushes must move freely in their holders. To clean brushes, use a dry piece of non-linty cloth. If brushes are coated with any substance, remove this substance with fine sandpaper glued to a flat piece of wood. Do not sandpaper excessively or round the contact of any brush. Be sure that the inside of the brushholder is clean and smooth. Fine sandpaper on a flat surface should be used for cleaning the brushholder.

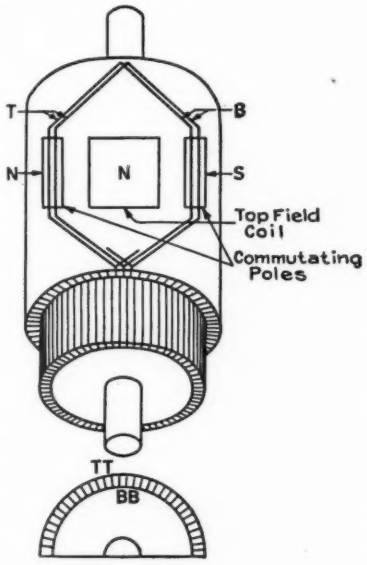
Setting Brushes

How to Set Brushes on Neutral: Direct-current motors have their brushes set on the commutator at the neutral point, where the armature current reverses direction. At this point, the best commutation is usually obtained. The neutral point may shift under load, particularly on machines that do not have commutating poles.

In most instances, the brushes have been carefully set at the neutral position at the factory. The brushes are either permanently fixed on neutral, or, the position is marked. Mechanical neutral is usually considered to be the mid-point of the arc between two main pole center lines. The brushes of commutating pole machines are quite often set slightly off this mechanical neutral. If necessary, the brushes can be shifted slightly from the neutral point in order to secure the best commutation. Brush shifting should be done with the machine disconnected from the source of power. It is not safe to shift the brushes very far.

The mechanical neutral can be determined as follows and reference to Fig. 4:

First. Turn the armature over until the two slots painted red are directly under the center lines of two commutating poles, or, equal distances from them. Where there are no commutating poles the armature should be turned until the two painted slots are midway between the two main poles and equal distances from them. The center of the group of commutator bars, which are stamped and painted red at the end, indicates the mechanical neutral.



Second. In some instances, the neutral is marked by a straight line drawn across the yoke and across the bearing or end shield with an arrow indicating the direction of rotation. The brushes of non-commutating pole machines require some forward lead for generators (backward for motors) which is indicated by a mark on the brush yoke for the best operating position.

Brush Spacing: To check the brush spacing accurately place a strip of paper tightly around the commutator and mark it to the exact commutator circumference as shown in Fig. 5. Remove the paper and accurately divide the circumference length into as many divisions as there are brush groups. Draw a line squirely across the paper at each division, to guide in locating the brushes. After the studs and brushes have been set accurately, it might seem reasonable to expect that if the brushes were put in the holders, they would be correctly spaced around the commutator. However, this may not be true. Slight inaccuracies in the brush rigging may be accumulative and cause an error in the brush spacing. Also, counting the number of commutator bars and dividing them into as many equal groups as there are brushholder studs

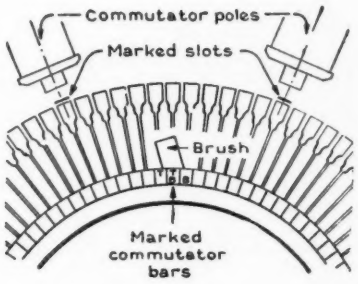


Fig. 4. Factory marks on armature slots and commutator bars help to locate the neutral

cannot be used as a guide to check the brush spacing, because, the commutator bars and the insulation between them may vary in thickness.

To obtain very good commutation on direct-current machines, brushes must be carefully spaced around the commutator and set at the proper angle. The studs that support the brushholders must be carefully set not just tightened into place and allowed to come where they will. Inaccuracies in the different parts of the brush rigging may accumulate in some cases and cause a considerable error in the stud alignment with the commutator. Therefore, determine first that approximate distance of the studs from the commutator to give correct angle of the brushholders when they are set about ⅛ in. from the commutator. With double brushholder construction, the distance from the holder to the commutator is usu-

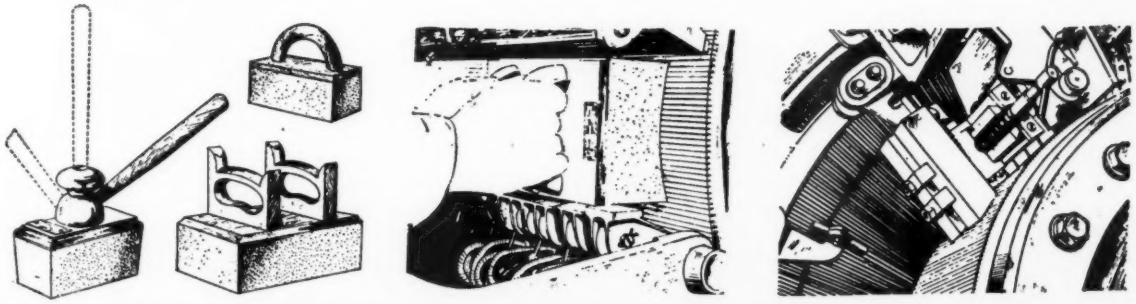


Fig. 3. At the left, various types of hand stones used for grinding commutators. In the center, one type of hand stone in use. At the right, a stone mounted in a special rest on a brush holder stud

Fig. 5. The first step in checking brush spacing is to put a strip of paper tightly around the commutator and mark the exact circumference

has been cut to the proper angle, adjust one holder and its stud until the brush face is tangent to the commutator, when the holder is about ⅛ in. away. Use this setting as a guide for the other. Excessive clearance of brushes should be avoided. The results of such a condition are shown in Fig. 7.

How to Set Brushes at Correct Angle: On direct-current motors and generators, brushes are set so as to approach the commutator in one of three different ways; radially, leading, or trailing. The brush angle depends upon the commutator speed, the direction of rotation, and upon the service requirements with respect to rotation in either direction. For low speeds, in feet per minute of the commutator surface, the brushes should be set leading at an angle of approximately 20 deg. For high speeds, in feet per minute on the commutator, the brushes also should be set leading from about 30 to 40 deg from the vertical.

ally less than ⅛ in. This prevents the brushes from chattering and the brush toes from touching.

How to Stagger and Set the Brushholders: Stagger the brushholders on pairs of studs so that the brushes on one pair ride on the space between the brushes in an adjacent pair, as at A. Fig. 6. This distributes brush wear across the commutator. Brushes of the same polarity should not track each other, as at B, Fig 6, because wear on the commutator when current flows from brushes to commutator differs from wear when current flows from commutator to brushes. On 4- or 8-pole machines, correct brush staggering is done as at A; but on 6-pole, set two pairs of brushes as at A, and one as at B. Setting the brushholders with relation to the commutator varies slightly with the brushholder type, but in all cases pairs of brushes should be set as at A, and one pair as at B.

Setting of brushholders with relation to the commutator, varies slightly with brushholder type, but in all cases the holders should be set equal distances from the commutator. Usually, this distance does not exceed ⅛ in. For a gage, use strips of fiber to obtain the proper thickness. Place the gage under a brushholder, loosen the setscrews or clamping bolts, move the holder down until it rests firmly on the fiber, and then securely fix the holder in place. Repeat this operation on all holders.

If work is started with the brush rigging dismantled, manipulate the adjustment of one brushholder and its stud until the desired angle of the brush on the commutator is obtained. Then set all the others the same way. If the wearing face of the brushes

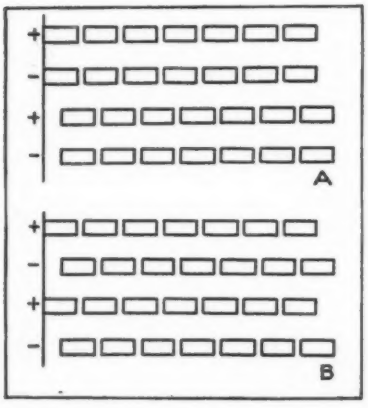


Fig. 6. Diagrams showing two methods of staggering brushes

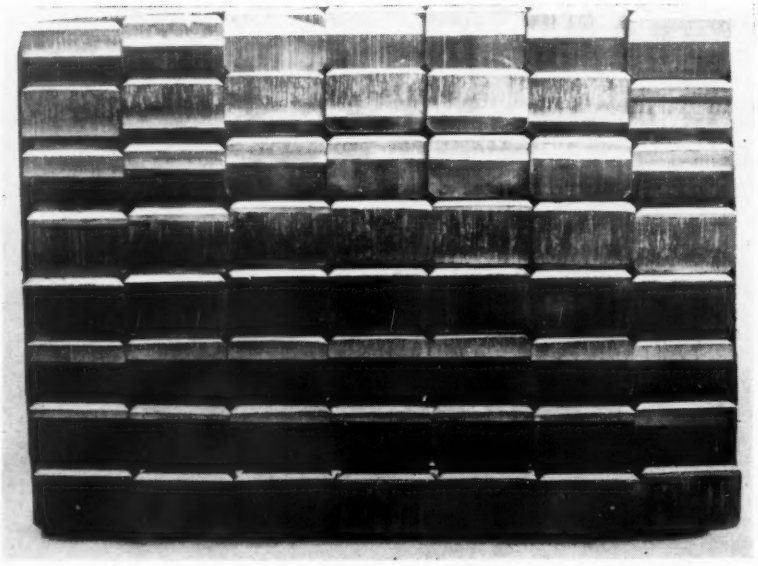


Fig. 7. This set of brushes had excessive clearance in the holder which permitted two or more fits on the commutator surface. This resulted in sparking and high temperature from overloading of the brushes and contacts

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STUDIES OF MOPPING show that the average individual can mop, rinse, and conduct incidental operations so as to clean 1100 sq ft of floor area per hr. This varies, however, from 500 to 2000 sq ft depending upon the operators skill, the amount of dirt, the number of obstructions, and the distance necessary to carry the water. Of the 60 min in the hour, approximately 20 is required for mopping, 21 for rinsing, 8 for wringing the mop and the 11 for transportation of water and supplies. About 100 sq ft can be cleaned with one application of cleaning solution.

Modern Construction of Industrial Buildings

Machine shop, glass-blowing department, 10,000 volume library . . . Conference room with movie projector . . . cafeteria with modern kitchen . . . Central photographic and reproduction departments and five individual darkrooms which provide every facility for group of technicians and scientists . . . Safety features . . . Push-button emergency shut-off controls . . . Shatter-proof safety glass . . . Selfstarting safety showers . . . All piping and wiring concentrated

Fig. 1. Large evaporative cooling tower which serves air conditioning system is located behind this entrance to Shell Oil Company's new laboratory at Houston.

SHELL OIL COMPANY'S new Exploration and Production Research Laboratory in Houston, Texas, is the largest industrial research center in that state.

It is one of the world's most extensive geophysical laboratories, a two-story welded steel structure which illustrates how uniform control of light, temperature, humidity and sound can pave the way for the attainment of high precision standards, working conditions, and efficient layout.

There are more than 100 separate working areas in the 44,000 sq ft, air-conditioned layout, which has been arranged in the form of an H so that the present structure could be duplicated in future expansion. The wide range of activities carried on in the building is indicated by the auxiliary facilities required by the large staff of scientists who will carry on the actual work of physical, chemical and geophysical research.

In addition to the 17 three-room laboratory suites and several general laboratories, there are a large machine shop with more than $100,000 worth of precision machine tools to provide equipment for the staff, a glass-blowing department, a paneled library with shelf space for 10,000 volumes, a conference room with movie projection facilities seating up to 75, a 125-seat cafeteria with modern kitchen, five individual dark rooms, plus large central photographic and reproduction departments.

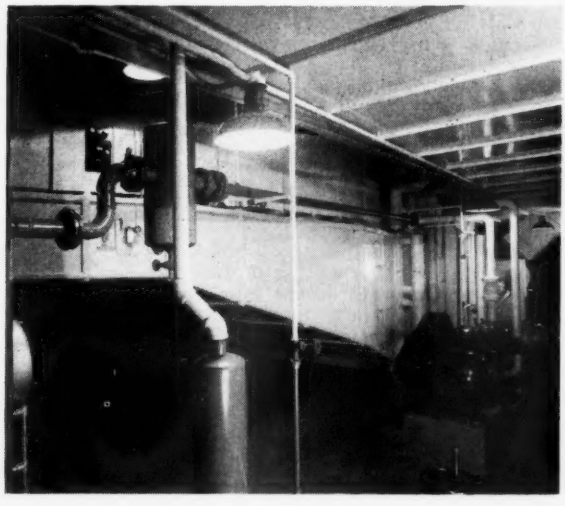
Newly developed construction materials and special building equipment employed in combination with new engineering techniques have provided a highly efficient, economical, comfortable and convenient structure from which the normal hazards of petroleum laboratory operations have been eliminated by unusual safety precautions. Shatterproof safety glass has been used throughout all interior partitions and doors, and push-button emergency shut-off controls for all the building services, as well as self-starting safety showers, have been located at strategic points throughout the laboratory suites and building corridors.

The utility services required for laboratory operation, including power, air, gas, steam, hot and cold water, distilled water, vacuum, etc., are carried into the individual rooms from the area between the first floor ceiling and the second floor, where piping, wiring and other utilities highways have all been concentrated in 4-foot galleries for ease of access in the face of ever-changing laboratory requirements. These services are run up—or down—to the working areas either through the floor or through the building columns, from which they can be extended around the perimeter of the rooms to serve any combination of equipment. Thus, space within the building columns is used as a wireway, as a pipe chase for the multiple laboratory services, and as exhaust ducts through which air is drawn off under suction.

Because of the many sensitive elec-

Fig. 2. This view of the third floor penthouse shows how Robertson Q-panels were used throughout the floors and roofs. The building's boiler, which can be seen in the center, stands on a special concrete foundation, but all the other building equipment was installed on a concrete slab poured on the Q-panels

Fig. 3. Two of the principal supply ducts serving the double air conditioning system at Shell's laboratory are shown along the wall at the left. The lower duct carries the cold air and has been covered with cork insulation. Compressed air is provided by the 20 hp air compressor in the right foreground



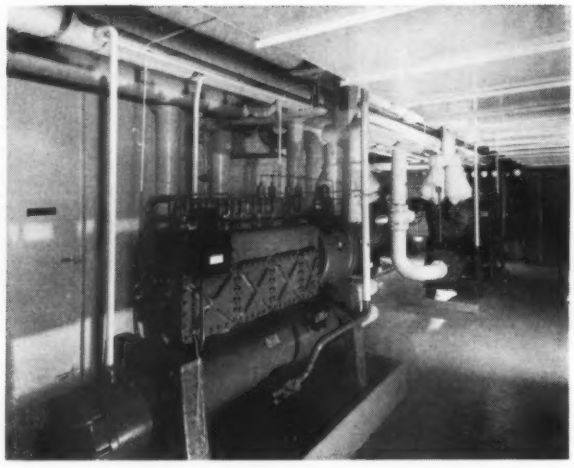


Fig. 4. Two refrigerating compressors, one of 40 tons capacity and the other of 100 tons, are located in the penthouse. Some of the cooling coils are located in a chamber on the left, directly adjacent to the 40 ton compressor (in the foreground) which has been equipped with a special low oil pressure cutout mounted on the side of the compressor

trical instruments used by Shell in developing new techniques for locating and developing oil fields, special precautions were taken in the design of power distribution systems. For this reason, special concentric cable was used in the main feeder lines and other wiring was designed to prevent stray currents developing localized magnetic disturbances.

Maximum flexibility was introduced into the two-voltage power distribution set-up for shop and laboratory operations in anticipation of the recurrent changes in layout and equipment always encountered in a building of this sort.

Prefabricated cellular steel Q-panels not only provide the structural support for the second floor, the equipment penthouse and the roof, but also serve as continuous raceways through which all electrical and signal circuit wiring has been installed.

One of the most unusual features of the whole electrical layout is in the emergency shut-off and alarm system. Push buttons at more than 20 different locations operate solenoid valves which close all the gas, air and other service lines, and drop out the main circuit breakers on power panels serving the immediate area, and simultaneously report the exact location of the trouble to the central switchboard operator.

Another innovation that makes Shell's new laboratory different from most other buildings is the location of its boiler, air-conditioning machinery and all the other central service equipment such as air compressors and central water filters, in the penthouse on the third floor.

In line with the wishes of the laboratory directors who wanted to reserve all of the space on the lower floors for functional activities of the working staff, engineers of The Austin Co. arranged to put the boiler in the high center section directly behind the evaporative cooling tower and to arrange the fans, refrigerating compressors and condensers and chemical dehumidifying equipment in the areas on either side.

The requirement that air within the building be maintained at 50 per cent relative humidity the year round has been economically met by the installation of Kathabar equipment which removes excess moisture from the air by chemical means. This unit, together with two refrigerating compressors, provides cooling equivalent to the melting of 240 t of ice per hour.

By distributing all the air for cooling or heat, summer or winter, through a double duct air-conditioning system, the atmospheric conditions within each laboratory area are automatically maintained at specified levels through the use of pneumatic room controls.

Due to the extraordinary requirements of chemical and geophysical research, all air entering the distribution system is passed through electrostatic precipitators which remove the finest dust particles. All air passing through the chemical laboratories is exhausted direct to the outside, as is that from the cafeteria and other sections where excessive heat, odors or vapors are released.

Lighting of better than 50 ft candles is maintained in the various laboratories, machine shop, offices and library, where two-lamp fluorescent units have been recessed in the acoustical ceilings. Egg crate louvers have been used to obtain even diffusion of light in the work areas, while diffusing glass has been installed for the same purpose in the library and executive suite. Regular fluorescent tubes installed with reflectors are used in lighting the structural glass pilasters in the cafeteria from within.

Continuous cold cathode high voltage tubing has been used in cove lighting around offices in the executive suits and in the cafeteria, as well as in the special drum-shaped cafeteria fixtures and in the lobby.

The ingenious concealed lobby lighting serves to illustrate an extensive use of aluminum in meeting special architectural problems presented by this project. Here, a series of 4-in. aluminum I-beams were set crosswise on the ceiling at intervals of about 2 ft between the entrance and a structural glass partition separating the reception desk from the back lobby. Four inverted troughs of extruded aluminum were then suspended from the beams, to serve as the lighting fixture in which cold cathode lamps were concealed, to produce a coffered ceiling effect.

More than 1,225 running feet of custom-designed sash fabricated from special aluminum extrusions were used in the installation of the two continuous bands of special heat-absorbing glass which form an integral part of the over-all design.

All the laboratory walls are faced with glazed ceramic tile, laid with straight horizontal and vertical joints to permit the installation of extruded aluminum channels which extend from floor to ceiling at 3 ft spacings along certain of the walls to facilitate the installation of experimental equipment and shelving. These channels will support loads up to 100 lb on arms extending out from the wall for a distance of 3 ft. Greens, blues, gray and buff have been used in the walls to differentiate the individual laboratory suites, all of which have asphalt tile floors and metal acoustic or perforated asbestos ceilings.

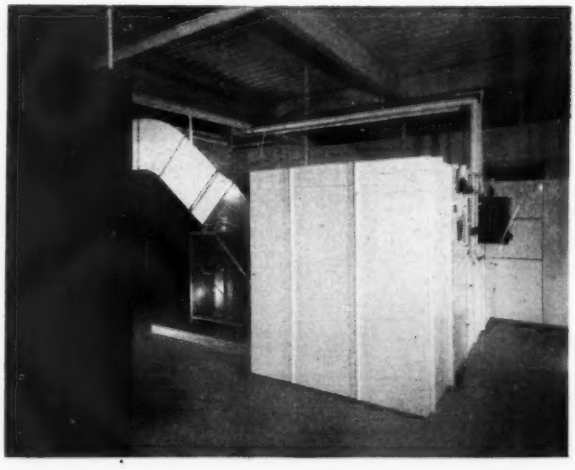


Fig. 5. All air entering the double duct air conditioning system is filtered through electrostatic precipitators, like that shown in the center, which removes dust and all other solids from the atmosphere. A portion of the main laboratory switchboard can be seen at the left. Sections of the welded steel frame and the Q-panels can be seen at the top of the photo

A number of the ground floor laboratories have been equipped with special concrete instrument stands which are completely isolated from the rest of the structure for use in experiments where this is desirable.

The main entrance lobby, corridors and stairwells have been faced from floor to ceiling with polished Texas fossil limestone similar to that used in the architectural features on the exterior. Floors throughout these areas are of colored terrazzo, with aluminum division strips, and the ceilings have been finished with acoustical plaster. Parquet flooring has been installed in the machine shop.

Offices located in the central portion of the building on the second floor have plastered walls, painted soft blue-gray and green.

The library, conference rooms and executive office suite which occupy the entire second floor of the west wing have been finished with squares of walnut paneling that give a simple textured effect and quiet atmosphere.

The details of design and construction were handled by members of The Austin Company's southwestern district organization, with offices in the M & M Building, Houston.

Fluid Drive Solves Yarn Breakage

THE APPLICATION of a new type of drive to an old slasher at the Langhorne Carpet Co., South Langhorne, Pa., solved a problem of yarn breakage which was seriously curtailing production.

This company has manufactured high grade Wilton and velvet rugs for many years during which there have been many changes in the machinery and materials used. In the present instance an old Butterworth slasher which was formerly used to size and tension jute warp yarn was changed over to rewind and tension a synthetic yarn known as Textilene. The latter is a new material which is said to provide a better warp for modern carpets and rugs.

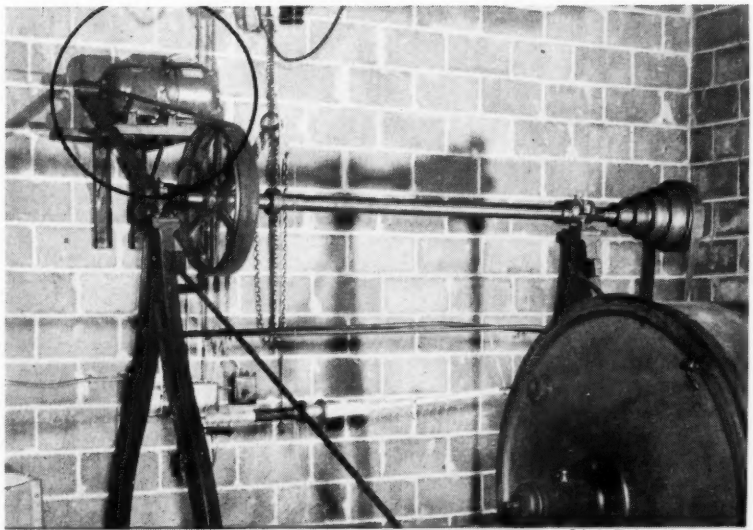
The yarn is rewound from multiple spools on a creel to the beam of the slasher, first passing around the eight large cylinders which were formerly steam heated. After Textilene was introduced the size box and steam connection were removed.

When jute was sized and tensioned on this slasher the beam head drive consisted of a flat belt to a countershaft forming part of the slasher and on which is mounted a cone step pulley for another flat belt drive to the beam. The step pulley is used to take care of beam speed changes necessitated by increases in the diameter of the beam as yarn is wound on it. This part of the drive has not been changed.

However it was found that the new warp yarn is less flexible than the jute formerly used. The result was that when the revamped slasher was started from rest there were frequent breakages of yarn. This was because there was a lack of flexibility in the drive which was not troublesome so long as the jute provided it, but when the new yarn was used it had so little stretch that it often broke when the machine started.

This was provided by a motorized "fluid drive" which consists of a general purpose induction motor and hydraulic coupling in one unit as shown, circled, in the illustration. The hydraulic, or fluid, coupling provides the cushioning effect for starting which is what is needed to prevent breakage of the yarn. This particular job called for a 3 hp motor.

Actually the effect of this fluid coupling between the motor and its load is that of an automatic clutch which cushions the changes in load. It permits the motor to accelerate quickly to full speed while the load is picked up gradually by the runner. That is, a motor of comparatively low starting torque can start the load without excessively high starting current. With this arrangement the motor develops torque in the fluid coupling in the ratio of the square of its speed up to its maximum running torque.



Link-Belt photograph

Shown circled in the illustration is the fluid drive powered by a 3 hp motor. At the other end of the shaft is the cone step pulley which is used to take care of beam speed changes

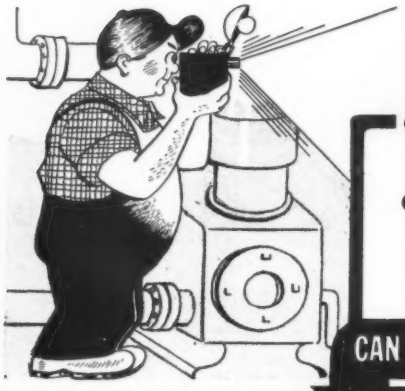
Brass and Copper Pipe

(Continued from page 25)

in four directions, lend themselves to the making of firm and secure joints from the four flat sides, and, are of one-piece construction so as to effect a saving in the cost of assembly and erection. The ventilating holes increase the current carrying capacities approximately 20 per cent over the unventilated tubes. Since the conductors are tubular in shape, the skin effect is considerably reduced, thus producing a high current carrying capacity per pound of metal actually used.

Assembly and erection of these conductors in the field has economically been accomplished by the oxyacetylene brazing method using phos-copper or Silfos brazing material. The joint design is very simple, the only precaution necessary is to insure that all ends to be joined are square so as to permit intimate contact at all points of the joint cross-section. Cover plates are recommended to be used on two opposite surfaces only.

These plates are usually of the same thickness as the tube and are used to increase the strength of the joint to safeguard against short circuit stresses. Figure 8 illustrates the method of joining straight lengths of square tubular bus, ventilated. Figure 9 shows the completed job with the use of four cover plates per joint. For right angle and tee joints, the brazing method simplifies the assembly since no special fittings are required. The use of angle supporting plates and cover plates are recommended to add stiffness to the right angle connections. Figure 5 illustrates the type of assembly for a right angle and a tee connection.



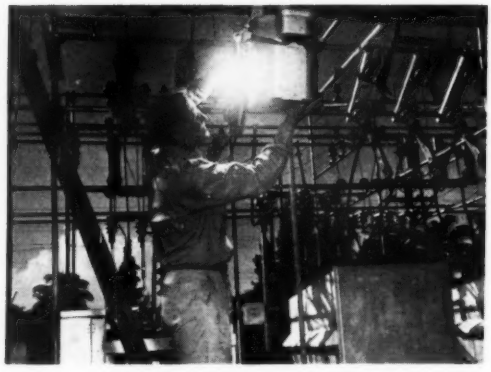
Safety Crimes

CAMERA CATCHES SAFETY BUSTERS IN ACTION

Accidents, like geniuses, are not born, they are made. The picture story below of an actual accident was re-enacted by members of a lineman's school in Miami to show how failure to follow simple rules results in injury.

CAN YOU POINT OUT THE DANGER CLUES IN THESE PICTURES?

An electrician goes to work alone to bolt some transfer braces in place



As he moved into working position, he lost his balance and grabbed for support. In doing so, he touched a hot lead

Severely burned, he fell to the ground

An electrician in a substation maintenance crew was recently assigned to brace a transformer which hung from a switch rack. He assured his foreman that he was capable of the task alone. He struck out with his ladder and tools, and wound up with a serious injury which nearly cost him his life.

What do you see that would have helped prevent this accident? See solution below. (Courtesy Florida Power and Light Co.)

If you had observed the situation closely, you would have easily seen that the electrician was using a ladder which was too short. He should have had one that would have reached the top of the switch rack. In that way it would have permitted him to work facing the ladder. The ladder should have been made secure in any event. If this was not feasible, a man should have been assigned to hold the ladder. The foreman should have paid strict attention to the electrician's working position. The electrician asked for trouble by placing his ladder in, and working in such an awkward position.

Report on Materials Handling Exposition

EVENT: 2nd National Materials Handling Exposition.

PLACE: Cleveland Auditorium, Cleveland, Ohio.

TIME: January 12 to 16.

FEATURES: Papers on materials handling and allied subjects presented by 18 authorities from every type of industry; thirty-one industrial movies covering every phase of materials handling; Materials Handling Demonstration showing advanced techniques involving use of newest types of equipment. ASME Materials Handling Conference held at the Hotel Statler in conjunction with the Exposition. Attendance: 16,000.

AFTER VIEWING this Exposition with its hundreds of varied products covering thousands of square feet of floor space, and after attending the technical sessions, one must inevitably come to the conclusion that the materials handling industry is far from static.

Old-line companies have improved their products and broadened their concept of the field. Other well-established companies have seen the huge potential in materials handling and have put their resources behind the development of revolutionary products.

Trends of the past year, as shown at the Exposition, were definite and unmistakable. Widespread use of the lighter metals, magnesium and aluminum, was particularly marked in the hand truck, pallet and caster booths. The move toward greater specialization in fork truck attachments could be seen in many displays. One of these was a set of gripping forks which would grab, lift and move stacks of objects as difficult to hold as a loose pile of brick. Another was a barrel lifting attachment designed to move four barrels at a time without pallets or skids. Still a third was a pair of twin clamping arms to grip long stacks of plywood or similarly-shaped objects. Another was a gripping, pulling, pushing attachment to permit the use of corrugated paper sheets for pallets.

More positive and simpler controls for trucks, conveyors and other motorized equipment were evident and the introduction of specialized equipment reached a high point in the booth of one manufacturer. This exhibit showed an automatic pallet stacker and loader which could be so controlled as to stack cartons and cases, direct from the production line, in as many as 18 different patterns.

That is what you would likely have seen with a once-over-lightly coverage. With more time, and more comfortable shoes, you might see all or many of the items described in the following paragraphs:

Conveyors

Among the many conveyors on display was the roller wheel conveyor of The E. W. Buschman Co. An innovation incorporated in this conveyor was Buschman's 3-Way Switch in which a simple hand lever switches package travel to any of three directions: right, left or straight ahead. In addition to this development, Buschman displayed an overhead cable trolley conveyor in operation, working in conjunction with its roller wheel conveyor, and a floor-to-floor belt elevator.

Harry J. Ferguson Co. was pointing out the advantages of its new 180 or 90 deg power curve for use between reversible belt conveyors when packages must be carried around on the horizontal. H. J. Ferguson, Jr., explained that conveyor lines equipped with this development were not bothered by pushing, pulling, or complete stoppages.

Two new products were being shown by Island Equipment Corp. One of these was the Power-Flux unit system, a powered belt conveyor which can be set up in as many units as desired. A series of these units will convey around turns, up and down grade, on the level or at right angles. When one job is completed (such as unloading from inside a box car, around through doors and into storage) the units may be rolled individually to the next job and there set up as conditions dictate. A differential coupling roll between units takes care of the turns. The second product displayed by Island was a portable belt conveyor booster which can be fed or discharged from either end.

A heavy-duty hopper-car unloading team for facilitating removal of sand or gravel and other bulk materials was made up by two new products announced at the Exposition by Barber-Greene Co. The 358 is a car unloader, with a capacity range up to 3 t per min for operating in pits or above rails. For working with the 358 is the new 363 stockpiler-loader; both are shown in Fig. 1.

What was described as a completely flexible drive was the fluid driven conveyor unit displayed by Material Movement Industries, Inc. Power is furnished to the conveyor by a hydraulic pumping unit which can be located on the ground, on a platform, or in any other convenient location. Two flexible lines lead from the pump to a small direct-connected turbine driving the conveyor.

Several new conveyor models were being shown by Rapids-Standard Co., Inc. These were: the new Floor-Veyor, Jr., a powered belt conveyor of new design which permits its manufacture in various standards lengths without additional redesign expense; the Poweroll, a horizontal belt conveyor; a new lightweight gravity conveyor made of aluminum; and a new Stevedore, Jr., a power belt conveyor with design features which increase its versatility as a stacker, booster or horizontal conveyor. This is shown by Fig. 2.

Standard Conveyor Co. was displaying its new model Projectoveyor, a conveyor especially designed for carrying commodities in and out of trailers, cars or trucks. It is a portable, lightweight unit which may be extended in either direction for a distance of 18 ft 8 in. without intermediate supports either on the ground or in the vehicle being unloaded. It can be used in series with a belt conveyor for uninterrupted flow directly to the point of piling or storage. The company's Extend-O-Veyor is a portable belt conveyor, available in four sizes, the largest of which will extend up to 46 ft 3 in. from a closed length of 9 ft 10 in.

A new all-aluminum prefabricated conveyor, with no elaborate parts to break down, was shown by Patron Transmission Co. Patron pointed out that this conveyor is rust, acid and

corrosion resistant and was most adaptable to application in the food industry. Steel-Parts Manufacturing Co.'s "portable-adjustable-elevating" conveyor, of all-steel construction, was described by this company as adaptable to many applications. It could be used for loading and unloading trucks, for machine to machine operation, for use in plants, warehouses, shops and similar locations.

Power Trucks

By far the largest group of displayed products was the power truck group which ranged from straddle

Fig. 1. This is the new car unloading "team" exhibited by Barber-Greene Co.

trucks to huge fork-ram trucks capable of lifting up to 30 t. Many of the manufacturers of this type of equipment had several models of trucks operating simultaneously in the booths.

Automatic Transportation Co. had its equipment almost constantly in action hauling, stacking and handling loads across the front two-thirds of its booth. A simulated boxcar helped in the visualization of the job these trucks could do. Automatic displayed, for the first time, a new motorized hand truck designed for handling live and semi-live skids and the new 1948 models of its line of Transporter motorized hand trucks.

An extremely versatile machine was on display by Silent Hoist & Crane Co. This was the Lift-O-Krane which combined three machines in one: a fork lift truck; a boom crane; and, a ram truck. Representatives of the company at the show pointed out that the truck could be purchased as a fork lift truck exclusively, without boom or ram attachments. It is also available as a boom crane only, without forks or rams.

There were many new features on Service Caster & Truck Corp's. 1948 model Motowlift fork lift trucks. This truck's fork lift is controlled by a single lever for lift, tilt and lower operations and all controls and the instrument cluster are incorporated in the steering column. Another feature to which attention was being directed was the design of the seat frame and floor plates which provided immediate accessibility for maintenance. Another new product on display by this company was the Leverlift lift truck for double faced pallet handling. Demonstrators showed how a set of ingenious toggle booster rollers float the truck frame over the bottom face of the pallet so gently that even an empty pallet was not displaced from its position.

The large exhibit of Yale & Towne Mfg. Co. consisted of its complete line of materials handling equipment. The new items which Yale featured were its new Load King hoist (this model was in constant automatic operation), the Load King dormant platform scale and a new 13 in. lift Worksaver platform truck. All trucks which were on display in this booth were operated in rotation or on request and the practical application of the various models was demonstrated.

A Three-Ring Circus was the unique manner chosen by Clark Equipment Co. to demonstrate its new Pul-Pac, a push-pull fork truck device specially designed for handling unit loads without the employment of conventional pallets. This development enables a fork truck to pick up, lift, carry and tier a unit load based on a sheet of corrugated paper. The device consists of a vertical movable rack which travels horizontally above the truck's broad carrying forks. A gripper attachment at the base of the rack seizes the projecting edge of the sheet of corru-

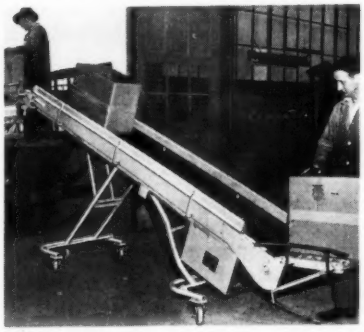


Fig. 2. This is the versatile Stevedore, Jr., shown by Rapids-Standard Co.

gated paper and then pulls the paper and the load on to the forks. At the destination the operation is reversed. This model and several others in Clark's line were in constant operation, one in each of the three rings. Bleacher-like seats for the audience added to the circus atmosphere.

One of the most unusual exhibits was that of The Electric Industrial Truck Assn. This consisted of a continuous demonstration featuring a miniature fork truck and a miniature tractor, all electrically driven and remotely controlled. The entire display was made up of scale model pallets, drums, packages, storage racks and other scale size objects designed to show proper techniques of materials handling with mobile equipment. The display is shown by Fig. 3.

Two outstanding features of Mercury Manufacturing Co's. display

These are two scenes at the Materials Handling Demonstration held at the Exposition on Wednesday afternoon. The entire session was devoted to a series of demonstrations of advanced techniques in materials handling

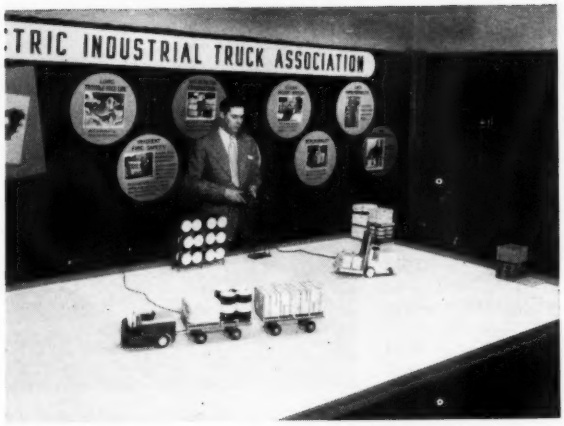


Fig. 3. One portion of the clever display of the Electric Industrial Truck Assn. This fork truck, controlled by the operator, would unload, carry, stack and load

Report on Materials Handling Exposition

were The Trackless Train and a mechanical strong arm device on a center control fork truck chassis. The former was a visual manner of emphasizing the company's complete line of tractor-trailer equipment. The latter, shown in Fig. 4, is an arm designed to handle 17 ft long packs of veneer weighing up to 1000 lb. The demonstration showed how the truck hydraulically picks up these packs by means of twin clamping arms. The pack, at the will of the operator, can then be elevated in a horizontal position and up-ended into a vertical position. Another new Mercury product was a 3 t high lift platform truck with a die pusher assembly to facilitate the pushing of heavy dies. This is accomplished by means of motor driven pushers built into the load platform.

At the booth of Baker Industrial Truck Div., Baker-Raulang Co., particular emphasis was placed on a new model 1000 lb fork truck. Company representatives, operating the truck, said that it was a model specially developed for plants where narrow aisles, congested areas, limited floor capacity, small and low capacity elevators are a factor. The Chore Boy line of equipment exhibited by The Buda Company had two new faces in the family. The fork truck addition to the line is a 2000 lb unit with a telescopic lift. It boasts a turning radius of 58 in., a twin-cylinder gasoline engine and fully hydraulic lift and tilt mechanism. The other new member at the show was the Model FH, a platform-type industrial truck which has a deck loading area of 20 sq ft. This unit was designed primarily for LCL freight and general industrial applications. Buda also had older models in the line on display and in operation and, in addition, exhibited ratchet and hydraulic jacks.

Featured by Schwitzer-Cummins Co. was a new Pallet Transporter type Load Dispatcher. This unit, representatives pointed out, is in the low priced field and is especially adaptable to low cost handling of pallet loads up to 3000 lb. Ross Carrier Co. displayed some of the largest trucks in the show. The company's straddle carriers and trucks with special attachments which would enable their use in practically every type of industry were in operation at the booth.

Another display of heavy equipment was featured in the booth of Hyster Co. Here, too, straddle trucks, heavy-duty industrial trucks and Karry-Kranes took the spotlight. An all-purpose fork attachment, the "Liftall," manufactured by Liftall Corp. was displayed in Hyster's booth. (It is sold and serviced by Hyster. Ed.) The Liftall consists of a set of gripping forks which, according to representatives in the booth, obviates the need for pallets or skids on many types of merchandise. An interesting sidelight is shown in Fig. 5. A manufacturer of round tile changed the shape of his product so it could be handled by the "Liftall."

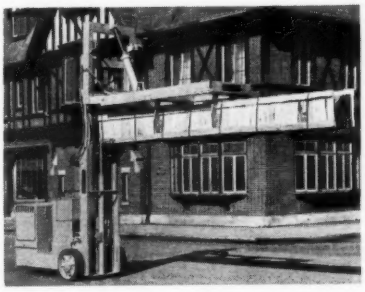


Fig. 4. A carrier and upender for long, ungainly products was on display by Mercury Mfg. Co.

"Silver Queen" is the name of the new industrial truck made by Moto-Truc Co., the smallest firm in the country to win an Army-Navy E during the war. At that time it had four employes; now it has 50.

Towmotor Corp., fronted by towering letters spelling out its name, with the catch line "The Biggest Name in the Show," tieing these letters together, had a display of its complete line of equipment. Focal point of interest was a barrel lifting attachment for lift trucks. This device was a four-departmented box which dropped over four grouped barrels, clamped on to them and elevated them.

A new controller, the Rolotac, was on display by The Elwell-Parker Electric Co. This controller, an integral part of Elwell-Parker's industrial trucks, was housed in a special open case to allow full view of its operating and construction characteristics. A representative of the company demonstrated its swift snap-action and showed the ease with which fingers and contacts could be interchanged.

Mobilift Corp. had a working display of its fork trucks stacking palletized loads three-high, Tract-R-Lift Corp. introduced a new fork lift truck at the Exposition. This unit had a 1000 lb capacity and was designed to meet floor load problems in multi-story buildings and at the same time meet the demands of the greater travel distances in one-story buildings.

Special attachments for its fork trucks and line of tractors were featured by Towmotor Corp. Among those on demonstration were the roll grip and upender accessory for turning and stacking rolls weighing up to 1500 lb each; a furnace charging attachment, a cotton bale stacker and a clamping device.

An exceptionally light weight model lift truck was exhibited by Transitier Truck Co. These smaller members of the lift truck group were busy in the Transitier booth lifting and handling pallets of varied types of merchandise. Company representatives pointed out that its light weight and pneumatic tires rendered it particularly useful on uneven or soft floors, for van loading and for low capacity

Fig. 5. The Liftall attachment enables the carrying of pallet-less and skid-less loads of hard-to-grasp merchandise. The photo illustrates a case where the manufacturer re-designed his product, changing its shape from round to hexagonal, so he might utilize the benefits of modern materials handling equipment

elevators. This equipment is shown by Fig. 6.

For the fast handling of materials, Kalamazoo Mfg. Co. was exhibiting its Speed Truck. This unit is a flat bed truck with a loading space of 20 sq ft. It has an operating speed of 15 mph, which, as company representatives pointed out, is nearly four times the speed which a man can travel with one-tenth the load.

The central portion of the display of Barrett-Cravens Co. consisted of its line of PowerOx, PalletOx and TractorOx trucks, all in operation. Also on display were two-wheel handtrucks, a portable elevator, skids and barrel trucks.

Motorized Hand Trucks

A new concern has entered the materials handling field with a bang. Bell Aircraft Corp. unveiled one of the popular items at the Exposition when it displayed its new materials handling device, the Prime Mover. As shown in Fig. 7, the Prime Mover climbs a 20 per cent grade with a capacity load of 1000 lb of wet or dry material. The unit has three wheels, can be equipped with a bucket or a steel and wood platform deck. A snowplow attachment is also available. When questioned concerning its proven applications, one of Bell's representatives at the show declared that several construction companies and industries of various types already have given the Prime Mover a thorough on-the-job testing.

Another motorized handtruck of completely new design was put on exhibition by Comet Manufacturing Co. At this first public showing the company reported that its new truck would carry loads up to 1500 lb up short 20 per cent grades with ease; 2000 lb can be carried on level hauls.

Fig. 6. This light, easily controlled truck was specifically designed for use in trucks, elevators and on rough floors

One model of this truck has a third wheel which supports the entire handle load and thus the operator has merely to steer and to regulate the speed.

Specialized Equipment

The Missing Link—in industrial mechanization—has now been found according to representatives of Productions Aids, Inc. This new device is called the Automatic Pallet Loader and it is shown in the accompanying illustration, Fig. 8. This loader, as demonstrated at the Exposition, takes cases or cartons direct from the conveyor line, after they have been sealed, loads them onto empty pallets, cross ties them whenever necessary and thereby makes a complete pallet load ready to be picked up by a lift truck for warehousing or shipping. This unit, set up and in actual operation in the company's booth, was taking cartons at varying rates of speed. This is made possible, representatives said, because the pallet loader is entirely independent of the conveyor line. If the cases come too rapidly for the capacity of

Fig. 7. The Prime Mover, a motorized wheelbarrow, was Bell Aircraft's bow to the materials handling field

the machine, an accumulator roller will hold back excess cases.

A portable utility ladder, described by its manufacturer, Economy Engineering Co., as more than a scaffold is designed to provide the utmost in safety for workmen engaged in overhead cleaning, painting, installation and maintenance work. One man was moving the platform unit around and elevating and lowering it. The company representatives said that it was available in three sizes with extended lengths of approximately 11, 12 and 15 ft.

A demonstration of Anthony Co's. Lift Gate for use in loading trucks was going on constantly in the company's booth. This device makes it possible for the truck driver to load and unload, without help, cargo weighing up to 2000 lb.

Overhead Conveyors

Three companies were displaying overhead conveying systems. The E. W. Buschman Co.; Whiting Corp.; and Richards-Wilcox Mfg. Co. Buschman's system was operating in con-

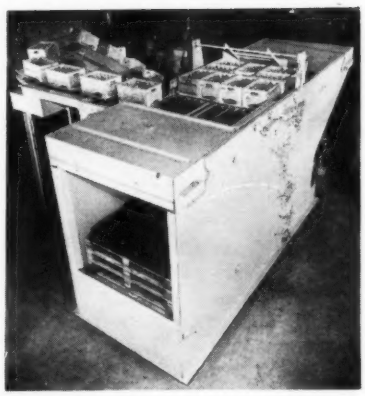


Fig. 8. This automatic pallet loader will stack cartons or cases in 18 different patterns, ready for the fork truck. It was introduced at the Exposition by Production Aids, Inc.

junction with a floor-to-floor elevator conveyor and a roller conveyor; Richards-Wilcox had a striking display featuring Zig-Zag-Up-and-Around-and-Down painted on large wooden blocks which were carried over the conveying course. Whiting Corp. used its overhead system for demonstration of various sizes of hoists.

Elevators, Lifts

Three elevators or lifting devices were shown at the Exposition. Otis Elevator Co. featured a recently standardized line of freight elevators specifically designed for loading by industrial trucks. The line is called Pow-R-Truck elevators and was so designed and constructed that it would take the added punishment of off-balance loading, added static loading and extra impact loading engendered by the modern lift truck. "Levelators," heavy duty elevating devices were shown by Rotary Lift Co. Rotary said that these lifts could be used for a wide variety of jobs, from loading trucks to use as transfer bridges. Another loading lift was exhibited by Globe Hoist Co.

Batteries, Chargers, Power Units

Guessing contests were popular with battery manufacturers. At least two of them, Gould Storage Battery Corp. and Electric Storage Battery Co., were giving prizes for contests of skill and a little luck. Both were displaying their line of batteries and in addition Gould was giving away a large table model radio and record player for the nearest correct answer to the question, "How many feet of glass tape insulation in a . . . industrial truck battery?" Electric Storage Battery had rigged up a device whereby one of its batteries was lifting itself to exhaustion. Question: "How many times?" A $50.00 U. S. Savings Bond was the prize here.

A nickel flake snowstorm machine was in action in the booth of Thomas

Fig. 9. The Rol-Truk, designed for handling heavy cylindrical objects was the contribution of Ironbound Box & Lumber Co.

A. Edison, Inc. in order to dramatize the lightness of the nickel flake used in the positive tubes of the Edison cells. To show the internal steel construction of a cell a portion of the steel container was cut away.

Several companies were displaying battery chargers. The Apparatus Department of General Electric Co. was showing two battery charging outfits, one of them a brand new unit, motor-driven, designed for charging 6-cell lead-acid, and 10-cell Edison batteries. Starting, charging and shutdown are performed automatically by the unit. In addition to its standard units, The Electric Products Co. was showing a new single circuit battery charger for servicing one 15 or 16-cell battery. In this charger, too, starting, charging and shutdown are performed automatically.

A new line of Selenium chargers for hand truck batteries, lead-acid or nickel-alkaline, was being shown by Westinghouse Electric Corp. These new chargers, also completely automatic in operation, featured a Selenium cell having an exceptionally low rate of forward ageing and long life, according to representatives at the show.

Other exhibitors of battery chargers were Motor Generator Corp. and Federal Telephone & Radio Corp.

Industrial truck power units in several models and power ratings were displayed by The Ready-Power Co. One of these was a newly announced gas-electric unit, The Model Z, for motorized lift trucks. The company representatives in the booth reported that once the unit is started no further attention is required from the operator. Continuous, automatic, full-power operation is secured without slowing down and eventual shutdown due to voltage reduction.

Hoists

The opportunity to look at the inside of a heavy-duty electric hoist was provided by Robbins & Myers, Inc. The gear case of one of the company's standard 2 t hoists was replaced with a heavy plate of clear plastic. Other than this the company had on view several sizes and models of hoists in operation. Chisholm-Moore Hoist Corp. introduced the new CM Cyclone a heavy-duty, high speed hand hoist constructed of aluminum and steel. A new hoist, which with the addition of a stand becomes a jack, was featured by Coffing Hoist Co. Complete in three pieces this Hoist Jack has a rated capacity of 2000 lb and yet weighs only 25 lb complete with stand, hoist and handle. In addition to this new unit, the company also displayed its standard line of hoists.

Simplicity of construction and speed of operation of its line of chain hoists was the keynote of the display of David Round & Son. Working displays of two electric hoists and a Budgit Bridge Drive were starred in the booth of Manning, Maxwell & Moore, Inc., while electric hoists, stationary hoists and car pullers were in operation in American Engineering Co's. booth.

Cranes, Earth Movers

The self-propelled mobile crane, Unit 357, took its bow at the show

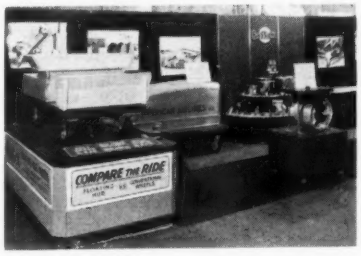


Fig. 10. Bassick's floating hub casters and the "largest caster ever built" were on display at the show

for Unit Crane & Shovel Corp. The company reports that the crane will, with proper attachments, do everything from unloading long lengths of structurals to excavating, removing trees or laying sewers. Insley Mfg. Corp. displayed a Model K12 Excavator with a clamshell attachment. The Power Crane and Shovel Assn. displayed 16 enlarged application pictures of crawler and rubber-tired cranes. Each picture represented a product of one of the 16 members of the association.

The "Payloader" a tractor shovel exhibited by The Frank G. Hough Co., was shown in several models. The one which attracted the most attention, however, was a scale model which took more than a year to build (100 of the full size units are turned out every month) and cost $8000.00 (the full-size units cost around $5000.00) according to C. E. Killebrew, Sales Manager.

An alliterative product is the Dempster-Dumpster produced and exhibited by Dempster Bros. One of these dumping-hoisting units was displayed in the Dempster booth mounted on the back of a Mack truck handling a 4 cu yd drop bottom type of detachable Dumpster body. A new piece of equipment in the booth was the Industrial Dumpster which is smaller than the company's regular line.

Report on Materials Handling Exposition

Hand Trucks

Many and varied in size, shape and material were the hand trucks on display at the Exposition. Magnesium hand trucks were being shown by both Magline, Inc. and Magnesium Company of America. According to company officials in these booths the light weight factor of these new trucks permits increased pay loads and a reduction in worker fatigue. The Fairbanks Co. exhibit consisted of a curved background containing outlines of industrial buildings on which was superimposed a mockup of a two-wheel steel framed hand truck together with the company slogan. Types of hand trucks shown included both two and four-wheel units. Truck casters also were shown.

Four new products were introduced by the Lyon-Raymond Corp. One of these was the Tote-Pan lift truck. Made of tubular steel this product was rated with a capacity of 600 lb. Another new item was a single-stroke lift truck with skid-load capacity of 2500 lb.

Other new, lightweight trucks were announced and displayed by Aerol Co. and Unit Mfg. Co. The former are platform trucks of all-aluminum construction, and the latter are all-aluminum hand trucks. Skarnes Engineering & Supply Co. came up with two new models of its heavy duty Rol-A-Lifts, roller devices which may be placed under any crate up to 1500 lb making it immediately mobile. Representatives of Ironbound Box & Lumber Co. were busy demonstrating the company's new RolTruk, a simple, light weight lifting device for lifting and moving cylindrical objects as shown in Fig. 9. It was specifically designed for handling rolls of paper but it will as easily lift and carry any cylindrical object such as a drum, barrel, etc. The operator in showing how the truck worked said that only three steps were necessary for its operation: 1, Place against roll; 2, Lock arm in place with fingertip control; 3, Tilt truck back on wheels.

A miniature truck for easy demonstration purposes was displayed at the booth of Rol-Away Division, Beall Pipe & Tank Corp. This company's product is constructed of lightweight tubular material mounted on casters

and is designed for handling such materials as sheet metal, plate glass, plaster board and other large-area products.

Casters, Wheels

The Bassick Co. displayed in its booth what it believes to be the largest caster ever made. Built with shock absorber hubs, these casters were specially designed to assist in moving the B-36 planes, both during construction and on the flying field. Each caster has a load capacity of 25,000 lb. This floating hub shock absorber principle was convincingly demonstrated by means of a truck, on which these casters were installed, being bounced on a platform. Any spectator who cared to could ride on the platform of the truck to convince himself that the shock had been considerably absorbed by the hub. (See Fig 10.)

A complete line of steel disc wheels, spoke wheels and solid rubber and pneumatic tired wheels was on display at the booth of The Geneva Metal Wheel Co. The company's new line of molded-on solid rubber tired cast wheels was featured.

Saginaw Products Corp. displayed samples in its line of industrial pneumatic wheels, pressed steel and drop forged trolley assemblies as well as other conveyor parts.

Pallets, Skids, Boxes

Outstanding developments in the pallet industry seem to be the expendable pallet and the lightweight metal pallet. Examples of the former were on display at the booths of both Clark Equipment Co. and Addison-Sammes Corp. These pallets consist of rolls of corrugated board fastened to either one or two large pieces of corrugated board to form a single or double pallet. The metal pallets were introduced by Pittsburgh Steel Products Co. and consisted of eight-way pallets constructed of steel wire. Pittsburgh also exhibited steel bulkheads of steel wire and wire boxes called Cargotainers.

Two stackable devices were introduced by Industrial Washing Machine Corp. and McGrath St. Paul Co. The former showed a Stak Pallet, the dimensions of which could be varied to suit palletizing conditions in the plant. The latter introduced its new Nesting Skid. An aluminum pallet was shown for the first time by Reynolds Metal Co.

A line of rubber-covered handling equipment, including baskets for storing and departmental handling of precision finished, painted or plated parts, took its bow from the factory of Automotive Rubber Co. Equipment Manufacturers, Inc., introduced a new collapsible box known as the Kari-All. The Kari-All has removable sides and ends. When used as a box it is a general purpose container but by removing the side panels it becomes a rack. Subsequently it was demonstrated that by removing the ends it becomes a pallet.

A complete line of materials handling equipment was rounded out at the Exposition by The Monroe Auto Equipment Co. when it introduced a collapsible pallet box, an all-wood pallet and a full line of accessories for pallets, platforms, skids and boxes.

The Technical Sessions

KEYNOTE of the Exposition was sounded by Ezra W. Clark, materials handling consultant, Battle Creek, Mich. Mr. Clark declared that salesmanship was the mainspring of American industry. Having sold more than $100,000,000 worth of materials handling equipment in his career he was well qualified to suggest to the younger sales engineers present that they first learn who the responsible party is in every plant before wasting time knocking at wrong doors.

In some plants, Mr. Clark pointed out, it is the plant engineer who does the purchasing and is the one who decides who gets the order. The salesman may talk with the plant engineer as to the width of aisles, method of storing, time and method of shipment, or with the production engineer on problems of materials movements and the use of nonproductive labor in the plant, or these functions may be tied up in one man. Regardless of who the man is or what his title happens to be, the salesman must learn his objective.

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Materials Handling in a Public Warehouse, by J. Leo Cooke, Executive Vice President, Lehigh Warehouse and Transportation Co., Inc., was the first paper presented at the meeting. From his wide experience in the storage and handling of merchandise which must always be available on the customers' demands, Mr. Cooke was able to quote facts and figures on costs and savings. He stressed the point that mechanical materials handling equipment generally brings about a reduction in handling costs of anywhere from 20 to 60 or even higher per cent, not counting the terrific savings in time made available for other work.

Lehigh palletizes almost all commodities before they are stored, except where it is impractical to do so. When unpalletized material arrives for storage it is immediately transferred to empty pallets on four-wheel trailers. These trailers move it to the section of the warehouse where it will be stored; usually this involves the use of elevators which transport the merchandise to the proper floor. One of the four or five fork trucks on each floor removes the loaded pallet from the four-wheeler and stacks the pallet away. On outgoing merchandise the entire cycle is reversed.

At times pallets are loaded in the car or at the tailboard of a truck and then removed by means of hand-pallet machines or transporters to the elevators without the use of a four-wheel truck or conveyor. There are other times where a fork truck can pick up the palletized load directly from the car or tailboard of the truck and take it to the elevator; at the proper floor it is removed by another fork truck.

It is not possible to utilize the full benefits of mechanical materials handling, especially on LCL shipments from 25 to 50 per cent of handling must be manual. Mr. Cooke called for the formation of an authoritative group to study and define distribution in order to set up a method to measure its cost and then follow this definition with the establishment of a standard cost system.

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The Utilities' Materials Handling Problems, the second address to be given on the opening day, was delivered by R. A. Clark, Asst. General Storekeeper, Detroit Edison Co. Mr. Clark said that the average person had no conception of the vast quantities of materials which must be stored and distributed by a utility. Besides the 2500 t of coal used by one power plant in a day the entire system must carry around 3000 stock items, 2000 of which are spare parts for equipment. Then there are usually 50 to 75 different sizes of pipe, about 400 different sizes and types of valves and pipe fittings and about 500 assorted items such as bolts and nuts, small tools, paint and janitor supplies. Storage where they are immediately available is essential in the case of almost every repair part, even though those parts may lie unused for years.

Overhead transmission and distribution lines maintenance and construction in Detroit Edison's system cover such a wide flung area that it has been necessary to establish 16 warehouses to serve the area. Poles, delivered to these warehouses, are handled by boom cranes, taken off the flat cars, placed on skidways and graded by size and type. Poles are hauled 25 to 30 to a load, to point of use by a two-wheel trailer and truck. Hardware items, insulators and similar items are loaded at night onto

the trucks which have been backed for night storage against the warehouse docks.

The special handling jobs necessary for underground lines materials and substation equipment and supplies were detailed next. In summary the author pointed out that the quantity and bulk of material carried at the warehouses does not seem to justify large investments in mechanical handling equipment such as lift trucks, at each of these warehouses. And palletization has certain limitations, too. Nevertheless, he conceded, lift trucks and pallets can do a lot of good with certain types of materials. He feels there is a great possibility that the newer, specialized equipment will be of aid to the utilities.

• • •

Standardization of Materials Handling Equipment was the title of an address given by David H. Burton, engineer, Bakelite Corp., the morning of Jan. 13. Mr. Burton enumerated some of the arguments in favor of standardization. First of these was safety—some makes of trucks steer in opposite direction from the accustomed motion; some are left hand and others are right hand drive. The speed of one type is controlled by a pedal while others operate by circuit breaker control and hand operation. One unit tilts by lifting a lever and elevates or lowers by pulling another lever. These actions are directly opposite to the natural tendency of such motion. Mr. Burton felt that specialized operators rather than solving the problem would cause a loss in flexibility of the materials handling crew.

Maintenance and repairs were another factor which weighed heavily, in his belief, in favor of standardization. This would result in mechanics with a greater degree of knowledge regarding their machines, replacement parts would be easier to order, stock, catalog and inventory and the possibility of interchange of parts would be heightened.

Standardization, also would permit the most practical and economical layout of warehouse and storage areas, aisle marking would be uniform, as would turning areas, ceiling heights, doorways and head clearances. Mr. Burton, in closing, suggested that an exchange of data, pro and con standardization, would be helpful in arriving at the correct conclusions.

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Integrating the Use of Different Types of Materials Handling Equipment. Russell L. Franing, materials handling engineer, East Moline Works, International Harvester Co., covered the above subject on the afternoon of Jan. 13. Mr. Franing called attention to the fact that the present trend in industry is toward single story buildings and the elimination of hand handling of material. This calls for the utmost flexibility in plant layout and those plants which manufacture bulky products of a seasonable nature, such as the farm equipment made by Mr. Franing's firm, need tremendous floor space. This problem is particularly acute in the East Moline Works, one of the largest buildings in the world all on one floor and under one roof, almost 2,000,000 sq ft of floor space. Raw material arrives at this plant by rail, truck and water and the finished product is shipped the same ways. These shipments use approximately 8,000 tubular steel tiering racks, 6,000 pallets and 20,000 stacking skids. The sizes of each of these is some multiple of the others.

At the present time the East Moline Works is being completely rearranged to attain the best possible flow of material. The company is building a new steel storage and is concreting large areas of the yard. The principal carriers for moving simple stock and sub-assemblies between departments, Mr. Franing declared, are continuous chain-type overhead conveyors, tractor-trailer trains and power trucks. An overhead continuous chain type conveyor is used for moving skids, racks and bulky parts between departments and to shipping.

Minimum width aisles are 10 ft and operators are able to pull tractor-trailer trains of four-wheel steer trailers of almost any length anywhere in the plant. These trains actually supplement the stock conveyor. A continuous chain conveyor also is used for moving stock from sub-assembly through automatic paint and drying operations to intermediate storage or shipping.

Assembly lines in this plant are all powered by floor type continuous chain conveyors with the exception of one which is an overhead chain monorail. The general plan of assembly is to build as many sub-assemblies as possible along the line and feed them into the assembly stations by overhead rail, or hoist or on castered dollies. Other sub-assemblies are built at a considerable distance from the lines and delivered by overhead feeder conveyors on which the stock is synchronized by cycles. Small items are placed along the assembly line in stacking skids, pallets or tiering racks by power truck.

Mr. Franing's paper then covered the materials handling problems found in the handling of castings received from outside sources, the method of handling and storage and subsequent use of sheet steel, bar steel and angles, lumber products and collateral material. Work-in-process storage covers approximately 200,000 sq ft and requires the greatest possible utilization of floor space.

Report on Materials Handling Exposition

This is attained by stacking materials to full 14 ft truss height in skids, pallets and racks. Pattern of storage is rows of four and six with inspection aisles between each pair of cross rows of skids or racks. Mr. Franing concluded his paper by saying that simplicity should characterize the thinking of materials handling men so that, from a cost standpoint, the proper equipment is used for every job.

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Freight Elevator Applications was the title of an address given by W. W. Bryant, sales engineer for Westinghouse Electric Corp. Mr. Bryant listed the points which should be considered in order to make an adequate study for determining freight elevator size, capacity, speed and operation. These were: Distance the car must travel, number of floors, number of floors on which elevator must open on both sides; size, weight, type of product or unit to be carried, and method of loading; number of units handled per hour; and if the elevator also handles passengers during peak passenger periods.

The most useful and flexible type of operation for use with variable voltage and a-c rheostatic freight elevators, Mr. Bryant explained, is the selective collective equipment with an annunciator. The car may be operated without an attendant; when so operated calls registered on the pushbutton are collected and these calls are answered in the order they are approached, not in the order by which the calls are registered. When the car is loaded, the person attending the load may by-pass other calls by pressing a button, thus doing away with stops which would serve no purpose. Other types of controls were covered briefly. Mr. Bryant also discussed passenger loadings and budget prices.

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Planning a Storeroom Operation, by A. C. Farley, Davison Chemical Corp., was a paper delivered on the second day of the Exposition. Mr. Farley compared a storeroom with a mail order catalog; his parallel was drawn along the lines that storerooms should and must be catalogued in order that workers may quickly locate stored items.

The following seven points were the basic tools considered by Mr. Farley to be necessary for an efficient operation of the storeroom: 1, Full information as to items to be stored; 2, proper and adequate stor-

age areas; 3, storage aids and handling equipment such as adjustable bins, racks, hoists, monorails, etc.; 4, definite policy for inventory control; 5, a stores catalog, or, in the case of a small storeroom adequate inventory records; 6, adequate locator system; and 7, competent and qualified personnel.

Three factors which must be considered before establishing a system of storage are capacity, commodity and storage method. The capacity factor deals with the physical characteristics of the buildings and in this connection a space layout is necessary. A few of the basic rules for preparation of such a layout were enumerated by the speaker. It is necessary, Mr. Farley said, to: 1, Endeavor to separate receiving and shipping activities; 2, use doorways to determine layout of traffic aisles; 3, use pillars or posts to good advantage in determining aisles; 4, follow floor load capacities; 5, determine size of aisles for handling equipment to be used; 6, utilize lighting facilities; 7, follow local fire underwriters' rulings for placement of fire fighting equipment and storage standards; 8, properly protect fire fighting equipment; and 9, provide for safety of handling personnel.

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Coordinating Traffic with Materials Handling. W. Bert Watson, traffic manager, H. J. Heinz Co. of Canada, Ltd., declared that materials handling, packaging and palletization lose effectiveness and fail of economies unless properly adapted and fitted smoothly into the shipping and receiving of freight by any means of transportation. This resolves itself into a matter of structural design so that platforms, pallets, skids, bins, boxes or racks will, while maintaining maximum strength with minimum weight and bulk, fit into any shipping vehicle in such a manner that vacant space is minimized and need for blocking or bracing is reduced to a minimum. Through methods such as these, Mr. Watson believes, lies the solution to the tremendous problem of cutting distribution costs.

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Procedures for Making a Materials Handling Survey. A. E. Aukens, materials handling consultant, said that the first step to take in making a survey is to determine the extent to which management will back the recommended changes. Also, it is well to establish early whether the survey is meant to cover only one or a few of the processes and departments or whether it is to be plant-wide.

Physical limitation of the buildings will have a very definite effect on the details of the survey, Mr. Aukens cautioned. Load limitations, for example, will demand that lighter production equipment be assigned to upper levels. The factor of multiple levels demands that the equipment for horizontal movements be integrated with the equipment for vertical movements. A drawing of the floor plan of the complete plan should be acquired or prepared and the physical limits and anchor points should be marked in their true positions. Such a drawing is useful in studies of paths of flow and in the selection or specification of the system.

After the scope and physical limits have been established and before a detailed study is made of the materials flow, an estimate of the kind and amount of production for the next 1 to 3 yr should be obtained even though this will likely be only an approximation.

In dealing with the handling of products that have a definitely seasonal market, the production policy for those items are factors for consideration. If the entire year's production of those items is made during a 3-month period, space around the machines and the available handling equipment must be suited to the high volume of production for the shorter period.

In general, the characteristics of a material that determine its handling demand are weight, quantity, shape, fragility and perishability. In a secondary manner, the number of operations performed on a part will in-

You Can See These, Too!

The films listed here were shown in the Materials Handling theatre at the 2nd National Materials Handling Exposition. Arrangements for the showing of these films before company or engineering groups should be made through the manufacturers listed

Muscle Mike, star performer for Automatic Transportation Co.

Unit Load Methods of Bracing Carload Shipments, Acme Steel Co., 2840 Archer Ave., Chicago. Duration 30 min.

Up and Over, American Monorail Co., 13107 Athens, Cleveland, Ohio. Duration 20 min.

Transporter Newsreel, Pay Loads Pay Off, and Skylift Newsreel, Automatic Transportation Co., 101 W. 87th St., Chicago, Ill. Duration 20, 25 and 10 min, respectively.

Barber-Greenes in Action, Barber-Greene Co., Aurora, Ill., Duration 25 min.

Conveyor Design and Application, Bosworth Mfg. Co., Gaxton Bldg., Cleveland 15, Ohio. Duration 15 min.

Materials Handling Newsreels Nos. 1 and 2, Clark Tructractor, Battle Creek, Mich. Duration 30 min and 10 min, respectively.

Flow Process Chart . . . and How to Use It, Electric Industrial Truck Assn., 2928 41st St., Long Island City, N. Y. Duration 20 min.

Material Handling in Marine Terminal and Warehouse, The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14, Ohio. Duration 15 min.

New Horizons in Welding, Harnischfeger Corp., Milwaukee, Wis. Duration 30 min.

Model H-A Payloader, Frank G. Hough Co., Libertyville, Ill. Duration 15 min.

Straightline Unscrambling Table, Island Equipment Co., 55 W. 42nd St., New York City. Duration 35 min.

Handling Material Economically the Hydraulic Way, Joyce-Gridland Co., Dayton 3, Ohio. Duration 20 min.

Fork Truck Pallet Operation, Trackless Train Operation, and Electric Trucks Serving Industry, The Mercury Mfg. Co., 4132 S. Halsted St., Chicago 9, Ill. Duration 10, 10 and 30 min, respectively.

Mobilift Operations on Trucking Dock, Mobilift Corp., 34-38 Steinway St., Long Island City, New York. Duration 10 min.

Liftall Forks in Action, Morrison Co., 4119 Prospect Ave., Cleveland, Ohio. Duration 20 min.

Moving of Lumber, and Ross Lift Truck, Ross Carrier Co., Benton Harbor, Mich. Duration 20 and 15 min, respectively.

Krane Kar, Silent Hoist and Crane Co., 841-63 St., Brooklyn 20, N. Y. Duration 15 min.

It's Your Move, Thew Shovel Co., 1000 E. 28th St., Lorain, Ohio. Duration 10 min.

Pacemakers of Industry, and Automobile Manufacture, Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich. Duration 20 and 10 min, respectively.

Meet Micarta, Westinghouse Elec. Corp., 511 Wood St., Pittsburgh, Pa.

Harvest in a Hurry, Wooden Box Inst., Call Bldg., San Francisco, Calif. Duration 30 min.

It's Your Money, Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa. Duration 45 min.

crease its handling demand beyond the foregoing factors.

The first step in determining the handling cost is the preparation of a flow chart for each of the selected materials and each handling operation performed on the material is listed in sequence from receiving to finished product. The time required to perform each listed operation is marked opposite the description and is stated in decimals of hours. The number of units handled in the time stated and the number of men engaged in the operation should be shown, as the man hours expended on each piece must be calculated and indicated.

• • •

Materials Handling Factors in Plant Layout. This paper, presented on the last day of the Technical Sessions, was delivered by W. R. Postlewaite, engineer of Standard Oil Co. of California. The placement of a new building, Mr. Postlewaite said, should be governed to some extent by the available space on the site for railroad trackage to permit the construction of loading docks of sufficient length to care for the incoming and outgoing materials.

The overall interior plant arrangement should provide a streamlined flow of material from the time they are received, warehoused, processed, warehoused again and finally shipped. The sizing of the area needed to accommodate the truck fleet when not in use should be investigated when laying out the plant. This area usually contains the battery charging and servicing equipment; adequate facilities must be provided for refueling of gas-powered trucks. Wherever feasible, Mr. Postlewaite warned, sloping ramps should be avoided. If this is not possible make certain that no slope on these ramps exceeds a 10 per cent grade. Careful study should be made of heights and widths of box car doors inasmuch as this will influence dock board selection and heights of loading docks.

Portable dock plates often do not receive much consideration but they should, the speaker declared. Design of the plates must be such as to carry the concentrated front end load of the modern fork trucks. They should be proportioned to present a flat-lip approach at both the dock and car ends over a wide range in car floor heights.

The placing of loaded pallets on highway trucks of the flatbed type may be very neatly handled by providing long drive-in lanes or slots within the elevated warehouse floor so that fork trucks may have ready access to the bed from both sides. The dock height must, of course, be suited to the type and height of trucks to be loaded or unloaded.

Maintenance and Operation

Inexpensive Air Cleaner

IN OUR refinery we have an extraordinary number of instruments due to the processes involved. These instruments indicate and regulate the entire process. It is therefore essential that they be furnished with a supply of clean air. Each operating unit is equipped with air scrubbing equipment and auxiliary air compressors which cut in at a predetermined air pressure in case the main units fail.

Here is a piping diagram of the inexpensive and efficient air cleaner that we use. The cleaner, when constructed of 12 in. dia pipe and with each tank approximately 6 ft in height will handle air supply suitable for about 20 control instruments.

Lockport, Ill. G. A. L.

Two-Fold Water Problem Solved

A NATIONALLY known chemical company faced a complex problem of water supply. Although city water was available, the company had dug a well on the property. A high percentage of the volume of water used was required for cooling coils.

Two problems were faced. One was the uncertainty of yield from the well which varied from 25 to 50 gpm. The other problem was the temperatures of the water. In the summer months, the water often went as high as 75 F.

After studying all phases of the problem, it was estimated that an investment in a drilled well and the necessary pumping equipment would be justified if the total yield would be more than 100 gpm.

Drilling was started and after completion of one well it was determined that another well would be required to obtain the desired yield of more than 100 gpm. When the second well was drilled, the total yield from both wells was around 125 gpm.

Two identical Deming Pump Co's. deep well, water lubricated turbine pumps were installed. Those pumps deliver the total of about 125 gpm continuously from a pumping level of 175 ft.

The dug well was not abandoned. To utilize it, a two ball bearing centrifugal pump was installed—pumping to a common discharge line with one of the deep well turbines.

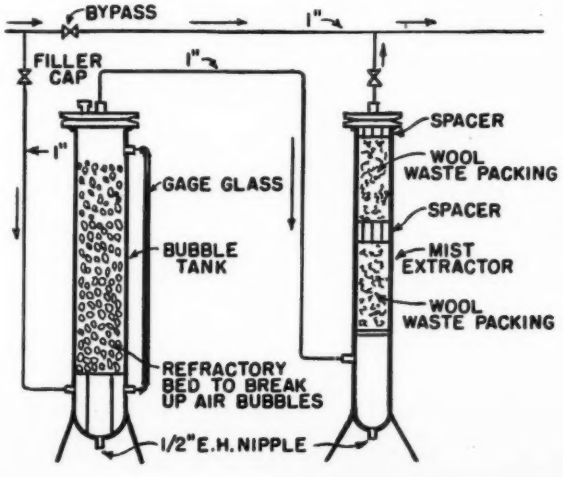
Then, in order to insure against any failure due to excessive load on the cooling coils, or for any other reason, it was planned to connect the system to the city water main so it could be used as an auxiliary if ever required.

However, a direct connection of the private system to the city water main was not possible due to regulations. Therefore, a 500 gal vertical steel tank was installed in which a constant water level is maintained by a float valve.

From that tank, water is supplied when required to the pressure system by the centrifugal pump.

To furnish pressure water and storage, a 5000 gal tank was installed in the same pump house with the turbine pumps and the centrifugal pump with its city water tank.

Controls for the pumps consist of a water levels control Type PW, 2 pump controller which regulates the air pressure, starts one deep well tur-



Details of air cleaner used in control instrument piping to improve operation

bine at a predetermined pressure drop and starts the other deep well turbine and shallow well pump at another pressure drop.

If the pressure (and the tank water level) continue to drop, a float control starts the city water pump and raises the pressure in the tank. After a year of service, the Chief Engineer of the company reports that the savings obtained with the complete systems were in line with original estimates.

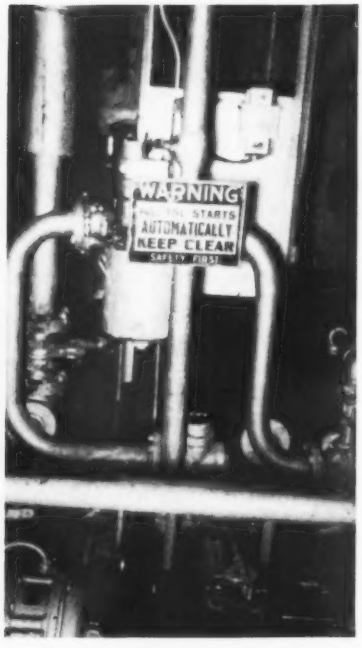
SAFETY FIRST PAYS

By C. C. Hermann

SAFETY FIRST IDEAS, plans and enforcement of safety rules constitute one of those intangible items difficult to evaluate in dollars and cents. Some manufacturing executives claim the cost per accident to run into four figures. Where the employee involved is a skilled employee the loss due to time off brought about by an accident is sometimes unbelievable.

In the plant of a prominent tooth paste manufacturer where considerable automatic machinery is in use steps have been taken to guard against possible accident due to machinery starting up automatically. All too frequent some employee would consider a machine standing apparently idle as being definitely idle. He becomes involved in the machine in some way and then suddenly and without warning the machine starts up because it is an automatic machine and may be started by lowering of pressure in the line, by a float switch, by a change in humidity or temperature or by many other types of differentials. Right then an accident occurs.

To avoid just such possibilities automatic machinery has been guarded in every conceivable manner including clear legible signs hung on the machine calling attention to the fact that the machine starts automatically. The employee seeing this sign will keep his hands off that machine and an accident has been avoided. Just how often this occurs it is difficult to estimate but the claim is that accidents have decreased since the use of the signs.



Warning sign hung on automatic machine

Chain Drive Rated at 1400 hp Handles 2600 hp

By Francis A. Westbrook

A 1400 HP silent chain, short center drive has been in successful operation for two years at the Washington, Pa., works of the Jessop Steel Co. This drive operates a 66 in., two-high roughing mill, and an 84 in. wide finishing mill. The drive is almost record-breaking as to horsepower transmitted by a single strand endless silent chain.

The 84 in. finishing mill was in continuous operation during the war and, in that time, finish rolled nearly 75 per cent of all armor plate used in United States aircraft. This mill is now being used at Jessop for finish rolling alloy and composite steels. It can roll stainless plate as wide as 80 in. and up to ¾ in. thick.

The chain is used for the first reduction drive. It has 2½ in. pitch and is 30 in. wide. It operates over cut tooth sprockets spaced on 9 ft, 4½ in. centers. The driving wheel has 47 teeth and is mounted on an 11¼ in. diameter roller bearing stub shaft direct-connected through a flexible coupling to the motor shaft. It runs at 240 rpm.

The driven sprocket has 129 teeth and operates at 87.5 rpm. It is 9 ft in diameter and weighs 12½ t with its flywheel rim. This drive is fully enclosed in a welded steel casing which is oil retaining and is provided with an oil pump and water circulating cooling coils to obviate overheating.

The second speed reduction, from 87.5 rpm to 38 rpm, consists of a herringbone gear and pinion mounted on 7 ft, 9.33 in. centers. It is also fully enclosed.

This 30 in. wide chain replaces a narrower one which was not satisfactory and the change was made in five days. The service requirements were determined by electrical tests which showed that at times the chain must handle peak loads up to 2600 hp and loads of over 2000 hp which are sustained for 10 seconds. These overloads occur when hot rolling 10 by 21 by 36 in. ingots down to 1½ or 1¼ in. thickness in 10 to 15 passes in the roughing mill. Reducing 16 by 9 ingots to 1¼ in. thickness in 14 passes produces similar temporary overloads.

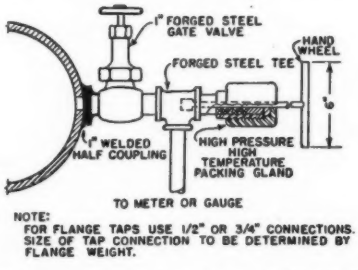
These conditions indicate the service requirements for a rolling mill drive as to dependability under very exacting circumstances. It has been in operation for two eight hour shifts daily for two years without any interruptions. Maintenance has consisted of a weekly inspection and changing the oil every three months.

Link-Belt Co.

Fig. 1. The driving sprocket of this transmission is direct-connected through a flexible coupling to the motor shaft. The drive operates a 66 in. two-high roughing mill and an 84 in. wide finishing mill

Orifice Cleanout Rod

WE WERE having considerable trouble with orifice taps clogging up with the residue from the process and throwing our meters off so that they gave false readings. In order to prevent this we installed the Cleanout rod pictured in the accompanying drawing. At first we tried using an ordinary valve packing gland but found that it would not stand up under the pressure and temperature the process exposed it to. This high pressure, high temperature packing gland is made up in our own shop of high pressure piping. The gland is two inches long. With this device the operator on his hourly rounds gives each rod a push and pull and then goes on. Formerly, they would clog up with 48 hours. Now, they last for three or four months.


1" FORGED STEEL GATE VALVE
HAND WHEEL
FORGED STEEL TEE
1" WELDED HALF COUPLING
HIGH PRESSURE HIGH TEMPERATURE PACKING GLAND
TO METER OR GAUGE
NOTE:
FOR FLANGE TAPS USE 1/2" OR 3/4" CONNECTIONS. SIZE OF TAP CONNECTION TO BE DETERMINED BY FLANGE WEIGHT.

Lockport, Ill. G. A. L.

Questions and Answers

Staining Furniture for Style

Q. Along with the length of women's skirts, we have a style problem which is proving very difficult. Our furniture is mostly mahogany finish but there are many pieces of light oak scattered around. This is annoying to certain people and we have orders to stain it all mahogany. We got some mahogany stain and tried it out with terrible results. What is the proper way to do a job like this?

A. S.

A. This is a rather simple operation although it has to be done with some care if the results are to be satisfactory. It is quite likely that you did not follow completely and carefully the directions of the paint dealer.

First the old finish should be removed with paint remover very thoroughly. The surface should then be carefully wiped with benzine to remove all traces of wax. The desired stain should then be applied and allowed to dry thoroughly. A paste wood filler, thinned to the consistency of thick cream with turpentine, should then be brushed on freely with the grain of the wood. Surplus filler should be removed with excelsior, waste, or a coarse cloth as soon as the shine has disappeared. After this the surface should be rubbed down well with fine sandpaper, thoroughly cleaned of dust and then waxed.

Answer

How to Repair a Concrete Floor

Q. *O. J. C. says: "The concrete floor in our plant is in very bad shape, and we thought some reader might have a suggestion to make so that we can repair the bad cracks and holes without having to tear up the whole floor."*

Asphalt Repair Material

DISINTEGRATED concrete floors may be easily renewed or resurfaced by use of an asphalt base material. Briefly, the area to be surfaced is cleaned thoroughly and bonded with a brush coat of a special asphalt bond. The mastic or asphalt topping is then applied at a depth of from ¼ to ½ in., depending upon the condition of the old surface. Uneven areas may be leveled in this manner. There are complete flooring units available which will eliminate guesswork in mixing proper proportions of asphalt and other materials. This complete packaged flooring needs only water added at the time of application.

R. L. MYERS
United Laboratories, Inc.
Cleveland, Ohio

Suggests Overnight Hardening Compound

IN REFERENCE to repairing concrete floors. Possibly a discovery of mine might prove useful to this inquirer.

I have found a preparation made especially for this purpose that works successfully. It is a cement made by Smooth-On Mfg. Co. of Jersey City, N. J. They call it their No. 7B Quick Floor Patch Cement.

This cement, which apparently contains a certain amount of iron, comes as a powder. You mix it with water and apply it like mortar or putty. The patches harden overnight. They stay hard and tight, and do not show impressions when the floor is used.

I pass this information on for whatever it may be worth. I might add that I first heard of this cement through reading an ad, and decided it was worth trying on some bad cracks and ruts. As the supply house I use did not happen to have this particular grade of Smooth-On in stock, I had to order it direct from the factory.

New York, N. Y. W. F.

How Prevent Fuses from Blowing

Q. A. H. P. says that all his 220 v power fuses are 30 amp and that an overload will frequently blow the fuses on the main board, thereby shutting all the machine down. He wants to know if he can put in two 30 amp fuse links on each fuse of the main board. Fuses are renewable. Will this increase his amperage twice?

Doubling Fuse Is Code Violation

I wish to state that doubling up on a refill and making a 30 amp fuse into a 60 amp fuse will give very poor results for the reason that the dimension of the 30 amp fuse limits clip contact, and radiation, to such a point that if any larger load than 30 amp is carried on this fuse it would simply disintegrate and may even cause a fire. The above method is a violation of the electrical code and may cause insurance trouble.

There are two methods that A. H. P. can use; one (if he has room) is to put another 30 amp set of clips and fuse parallel to each one of the present fuses. In other words, instead of doubling up on the refill he doubles up on the fuse. The other method is to make room for a 60 amp fuse to go in each leg of the circuit. It is understood that these fuses will be tapped off from bus bars that will have ample capacity for the larger sizes.

Star Fuse Co., Inc. M. PODELL
New York, N. Y.

Answer

Wants to Build a Transformer

Q. Laughinghouse wishes to construct a transformer for operation on 110 v ac. The secondary should deliver a current of 40 amp at 4 v. He wants to know what size core to use and how to proportion the size of wire and the number of turns in the primary and secondary.

Here Is How to Do It

In answer to W. B. Laughinghouse's question on transformers, I am taking it for granted the voltage is 60 cycles.

He should use as a core, electrical sheet steel No. 29 gage. Laminations from an old transformer will do if cleaned. It should be of the two legged core type but may be wound on one leg (which is the way I have designed it). He will need about 6.25 lb of steel. A sketch of the dimensions is attached.

The low voltage winding should be No. 4 double cotton covered. He will need 6⅔ ft not counting leads. It should be insulated from the core by 1/16 in. of paper or varnished cambric (preferably in a number of thin sheets) and should be of 13 turns. One layer with ⅛ in. keep back, i.e., winding starting ⅛ in. from edge of insulation.

The high voltage winding should consist of 347 turns of No. 18 enamel single cotton covered wire. Wound over 1/16 in. insulation between high and low voltage windings 56 turns to 6 layers and 11 turns on seventh with insulation of paper about 2 mils between windings. He will need 272.4 ft not counting leads.

I allowed 1000 cm per amp in the windings. A 90 per cent space factor in the core and 64.500 lines per sq in. of net area in the iron of the core.

There will be a loss of 4.72 watts in the HV winding and 2.7 watts in the LV winding with eddy currents adding about 10 per cent, the total copper loss will be about 8 watts.

Using iron with a loss of 0.7 watts per pound the iron loss will be 4.37, say 4.4 watts. The ratio of copper loss to core loss will then be $\frac{8}{4.4}$ or 1.8.

Bridgeport, Conn. E. S. KISH

Bulletins . . . . Catalogs

Keep posted on current practice, learn what other plant engineers are doing. Know the how and why when the need arises. Mark the bulletins you want by number—or ask questions on specific applications—on the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 18 and 19 and 58 and 59

MAINTENANCE

Item No. 101 **Brake Materials**—Bulletin Ind-146 covers a line of moulded and woven asbestos brake materials for all sorts of industrial service. Typical materials are shown along with photographs of their applications. A line of clutch facings are described along with their lifting capacity and sizes. Other items to be shown are lines of moulded brake blocks and brake lining in rolls and sheets. Gatke Corp.

Item No. 102 **Building Maintenance**—This 64-page handbook contains valuable information on various lines of floor materials, seals and finishes, weatherproofing and waterproofing materials and roofing items. Each product is amply illustrated and described with reference to its application, measurements and recommended mixes. Numerous tables show proper mixing proportions. Included is vital miscellaneous data on roofing and flooring. Cut-away diagrams show applicability of company's products to different type floors. Flexrock Co.

Item No. 103 **Sewer Cleaner**—This 6-page bulletin describes the uses to which sewer cleaning machine can be put, the method of operation, and its special features. It describes how it can be used for removing scale and rust from steam risers, and how it can eliminate slush and corrosive matter from process lines. It includes a detailed description of the method of assembly and a breakdown of the function of its various parts. Spartan Tool Co.

Item No. 104 **Paints and Builders Supplies**—This is an excellent 24-page catalog giving information on a complete line of paints, cleaners, flooring supplies, plasters and other building supplies. Each item is amply described with specific recommendations for use. Included is a two-page color chart spread of a paste or powder wall finish. Each color is then described and its specific uses are stated. Tamms Silica Co.

Item No. 105 **Metallizing Gun** — This 4-page bulletin contains valuable data about the engineering achievements that have been incorporated into this gun. The gas mixing chamber wire nozzle, the finger-tip turbine control and the self-aligned gear case are described and illustrated. The constant wire feed, the governor controlled air turbine and the renewable nozzle insert are also cited. Vande Mfg. Co.

Item No. 106 **Tube Cleaners**—A complete new line of tube cleaners is described in this 4-page bulletin. Tables list sizes and types of tubes, and specify the tube cleaner recommended for each. Parts and accessories illustrated include various types of heads, air valves for one-man operation, lubricators and hose. Also shown are various types and sizes of motors for operation with water, compressed air and steam. Elliott Co., ROTO Div.

Item No. 107 **Vacuum Cleaner**—An industrial portable vacuum cleaner is described in Bulletin No. 112D, 4 pages. Photographs illustrate typical applications and method of using cleaner. A table lists the specifications of two models. Other photographs show accessories. Spencer Turbine Co.

Item No. 108 **Metal Protection**—Bulletin No. 45, 4 pages, explains the uses of this process for protecting metal against heat oxidation. Three processes are described: one for temperatures of 1600 to 1800 F; one for temperatures of 1800 F and higher; and one for temperatures up to 1600 F. Various parts are shown to illustrate items that can be treated with the process. Metallizing Engineering Co., Inc.

Item No. 109 **Neutralizer**—An "electromatic neutralizer" is described in this 6-page handbook. It is shown to perfect a car's cooling system. A drawing shows how it is installed. It is noted that the neutralizer prevents rust in the radiator, corrosion, formation of scale, water boiling over and pit-holes in radiator. Electromatic Engineering Co.

Item No. 110 **Washfountain** — A washfountain that can be used by two people is described in this 4-page folder. It is shown to be foot controlled and spray operated. Photographs illustrate specific applications. Dimensional data is given and standard equipment is explained. Bradley Washfountain Co.

Item No. 111 **Group Washing**—A group of washfountains and multi-stall showers are presented in this 4-page folder. All items are illustrated. The outstanding advantages derived from using the equipment, the materials used and the standard equipment are explained. There is a table of condensed specifications, as well as typical washfountain roughing-in dimensions. Also described are lines of soap dispensers, drinking fountains and a "duo" washfountain. Bradley Washfountain Co.

MATERIALS HANDLING

Item No. 112 **Electric Fork Truck**—This 6-page bulletin illustrates and describes an electric fork truck in 3,000 and 4,000 lb capacities. In includes charts of load lengths for each capacity, dimensional drawings and complete specifications. Photographs show typical applications. Crescent Truck Co.

Item No. 113 **Conveyor-Elevator** — Bulletin No. 344, 8 pages, describes this conveyor-elevator which permits the conveying and elevating of bulk materials in any plane and in any direction. Included are drawings of various conveyor - elevator arrangements, photographs showing how they can move material in any direction and other photographs of typical installations. Line drawings are used to indicate function of the elements of the conveyor. Stephens-Adamson Mfg. Co.

Item No. 114 **Materials Handling Equipment**—A complete line of this equipment is illustrated in this handy 36-page Bulletin No. 801. Such items as chains, sprocket wheels, transmission machinery, feeders, conveyors, elevators, malleable castings and others are well photographed. Jeffrey Mfg. Co.

Item No. 115 **Service Elevator**—A fast interfloor transportation for use in buildings up to 200 ft high is described and illustrated in this new 8-page Bulletin No. 06B6878. Diagrams showing safety measures to be considered are included in the bulletin. Typical applications are illustrated and a large full-page photo gives construction features. Allis-Chalmers Mfg. Co.

Item No. 116 **Overhead Crane Control** — Consisting of a simple rotor and a stationary field member, this unit exerts all braking forces electromagnetically. Seven charts give characteristics of the unit. Typical applications and advantages are included in speed-load curves, magnetic, and braking this 6-page Bulletin No. C-39. Harnischfeger Corp.

Item No. 117 **Material Handling**—Systems for general industrial use, bulk material, warehousing, and special applications are described and illustrated in a new 16-page Bulletin No. 138. The company's 5-point plan which includes a complete plant survey, system design, proposal, supervised installation, and periodic check-up, is featured. Systems for handling barrels, kegs, drums, and rolls, as well as standard equipment for all systems, is also described and illustrated. Gifford-Wood Co.

Item No. 118 **Conveyors**—Bulletin No. 462 is a 6-page folder devoted to a description of this line of conveyors for moving coal, coke, ore, cement, chemicals, sand, bulk materials and other similar items. Photographs show typical installations and various conveyor models. Standard types of aprons and pans are illustrated with line drawings. Capacity tables and cross sections are included to help engineer design own conveyor systems. A full page of specifications and drawings of the conveyors concludes the folder. Chain Belt Co.

HUMIDIFIERS, VALVES, TRAPS

Item No. 119 **Strainers**—For use on water, steam, oil, air or gas supply lines are described and illustrated in Folder No. 115. A picture story on the last page of the folder gives complete instructions for cleaning. Hays Mfg. Co.

Item No. 120 **Integral Seat Valves**—Catalog No. 12-G6, 8 pages, contains valuable engineering data on this line of integral seat valves. Included are details of design, photographs and drawings of the various valves, dimensional tables and line drawings, and working pressure ratings. Described are integral seat valves and integral seat valves with body and bonnet a single unit. Edward Valves, Inc.

Item No. 121 **Steam Traps**—This 4-page bulletin tells "how to select the right type of steam trap." An illustrated chart permits the reader to select the steam trap for his particular application. Large cross-sectional illustrations accompany the text. Such traps as the thermostatic steam traps, the inverted bucket steam trap, the float-thermostatic steam traps and the liquid expansion steam traps are discussed. The advantages of these traps, the special features and the recommendations are treated. Sarco Co., Inc.

Item No. 122 **Valves**—Valves for industrial applications is the subject of this excellent 48-page Catalog No. 301. It describes valves for industrial hydraulics and fluid handling, and contains engineering, specification and application data, together with illustrations, for all types of globe, needle, check, relief and plug valves manufactured by the company. It is told how to order the valves. Included is a comparative pressure drop chart. An additional section treats other specialized valves and accessories for power application and instrumentation. Parker Appliance Co.

Item No. 123 **Steam Traps**—How to select the right type of steam trap is explained in this 4-page Bulletin No. 1600. An illustrated chart permits the reader, at a glance, to select the right type of steam trap for his particular application. Features, advantages, and recommendations are listed for each type of trap. Sarco Co., Inc.

Item No. 124 **Control Valve**—A solenoid valve for the control of water, oil, steam and air is described and illustrated in Folder No. 117. The method of operation is explained step by step and the company's three selections of piping methods are illustrated. Hays Mfg. Co.

Item No. 125 **Valves and Traps** — **Reducing** valves and air and steam traps are described and illustrated in three folders conveniently bound

in a paper binder. Specifications, typical installations, design features, and prices are included. Capacities of the traps and valves are given in special tables featured with the bulletins. The C. E. Squires Co.

Item No. 126 **Protecting Valves** — A line of bleeder line protecting valves is described in this 24-page Bulletin 8-K. Drawings and text describe the various valves and their operation. Cross section diagrams show integral parts of the different valves, specifying the part and giving the material of which it is made. A number of tables give complete dimensions, weights and connection sizes for each type valve. Schutte and Koerting Co.

Item No. 127 **Valve Bulletin**—Contained in this 12-page Bulletin No. 101A is information on lines of back pressure, exhaust relief, stop and check, relief and non-return valves, an air vent, a steam trap, and condensate traps. Complete engineering data includes diagrams of the units, price lists and dimensional tables. Davis Regulator Co.

Item No. 128 **Safety and Relief Valves**—This is a 6-page condensed specifications bulletin No. 50 for safety and relief valves. It facilitates the prompt selection of these valves by means of a detailed index comprising two full pages. This listing gives all type numbers and other pertinent data, together with comparison numbers of other commonly used valves. Sizes, pressures and materials are indicated. Another two pages are devoted to a display of 31 separate valve sectional line illustrations. Farris Engineering Corp.

Item No. 129 **Valve Bulletin**—Contained in this 8-page Bulletin No. 101AA is information on lines of float boxes, internal float type units, float box with valve, float box with pilot valve and diaphragm motor valves. All items are well diagrammed and described with accompanying price lists. Davis Regulator Co.

Item No. 130 **Air Eliminators**—Air eliminators for hot or cold water pipe lines, radiators, unit heaters, tanks and coils are described in this 6-page handbook. The problem, "Do you have circulation troubles?" is presented with a discussion of the help that the air eliminators can give. Three diagrams show the venting of trapped mains and circulating lines; venting of hot water convector radiator with no air chamber necessary and the venting of hot water unit heater. Maid-O'-Mist, Inc.

TOOLS

Item No. 131 **Hydraulic Jacks**—A line of hydraulic jacks is described in Catalog No. J-46, 12 pages. Contained are descriptions of hand jacks up to 100 t capacity and gauge-equipped jacks. All jacks are well illustrated. Specifications are given and its uses are photographed. The various features of the jacks are explained. Blackhawk Mfg. Co.

Item No. 132 **Cemented Carbide** — Catalog GT-200, 64 pages, includes complete engineering data on a line of cemented carbide tools, blanks, wear parts and specialties. Applications are illustrated. A guide to carbide needs is contained in a 1-page contents spread. All standard tools, blanks, wear parts and specialties are described along with drawings of product, drawings of typical applications and lists of specifications and prices. Carboloy Co., Inc.

Item No. 133 **Electric Tools**—A line of electric hammers, drills, screwdrivers, sanders and grinders is described in this 6-page folder. Typical applications of the devices are shown, and each model is described. Included are specifications and photographs of the units. Syntron Co.

Item No. 134 **Electric Drill Kit**—This new ¼ in. capacity, light duty electric drill, included in a case with 20 twist drills, is described in 4-page Bulletin CC-2. An enlarged photograph shows the drill and the ten sizes of drills for drilling iron and steel and ten sizes for wood and plastic. The saw-grip handle feature of the drill is explained and the new twist drill design for the drills is described. Century Twist Drill Works, Div. Republic Drill and Tool Co.

Item No. 135 **Portable Power Tools**—This is a 32-page handbook describing many portable power tools. Included are such items as: saws, planes, drills, screwdrivers, sanders, etc. Photographs illustrate each tool, and price is listed. Specifications are given and usage is explained. Mall Tool Co.

Item No. 136 **Impact Tool**—A new all-purpose electric impact tool is described in this Bulletin 5030. Typical uses for the tool are photographed. The standard and accessory equipment is listed and illustrated, and its specifications are noted. The tool is shown to be used for applying and removing nuts, drilling, reaming, tapping, running wire brushes and other related duties. Ingersoll-Rand.

Item No. 137 **Jackhammer**—A utility jackhammer is described in this 4-page bulletin. Photographs show typical applications. The specifications, standard and accessory equipment are listed. It is cited that the jackhammer can be used by maintenance crews, plumbers, electricians, construction crews and millwrights. Ingersoll-Rand.

ELECTRICAL

Item No. 138 **Tank Rheostats**—Cast grid type tank rheostats for electroplating control are described in this Bulletin 500, 4 pages. Illustrated are various models. The rheostat and construction features are amply explained. Included is a detail of a toggle switch and a top view showing strap copper connections between contacts and grid resistors. The specifications of standard 3 v drop rheostat are listed. Photographed are various other products of the company. Columbia Electric Mfg. Co.

Item No. 139 **Motor and Generator Brushes**—In this excellent 42-page Catalog No. 25 is invaluable engineering data on a line of motor and generator brushes and carbon products. The catalog covers such material as manufacture, grade classification, fields of application and description of brush grades. The characteristics of brush grades and grade recommendation are included in two full-page tables. Brush definitions and standards are given. Shunt locations are explained as well as method of installation of brushes and how to order brushes. Included is a 2-page brush data sheet along with brush definitions. A line of welding carbon products is also shown. Speer Carbon Co.

Item No. 140 **Inter-Communication** — A complete line of inter-communication systems is described in this 12-page catalog. All systems presented are accompanied with drawings of suggested applications. It is shown how each model acts within the system. A price list accompanies the catalog. Talk-A-Phone Co.

Item No. 141 **Liquid Level Gages** — Bulletin 6405, 4 pages, contains descriptions of this line of remote reading gages, direct reading liquidometers and dial type hydrostatic gages. A diagram illustrates the "Balanced Hydraulic Transmission" principle used in the remote reading gauges. The uses of the models are explained and the outstanding features are listed. The liquids in which the instruments can be used are also listed. Liquidometer Corp.

Item No. 142 **Terminal Blocks**—These feed-through terminal blocks are described in Bulletin DS-115. It is shown how they can be used for sub-panel and chassis connections where a soldered connection is desired. Mounting dimensions are given together with a dimensional drawing and a price list. Curtis Development & Mfg. Co.

Item No. 143 **Thermocouples** — The company stock program for thermocouples, thermocouple wire, protection wire, protection tubes, terminal heads, lead wire and accessories is described in Bulletin P1235, 12 pages. A guide to selecting thermocouples and protection wells is included. In describing each item, it is shown how to select the unit and how to order. All items are illustrated by line drawings. A price list accompanies the bulletin. Bristol Co.

Item No. 144 **Fuses**—Contained in this 24-page handbook is valuable information on a line of renewable fuses. The powder packing and other features of these fuses is explained and illustrated by many drawings. Relative questions are asked. It is shown how the fuses do not employ any fibre bridges, how they cannot be tampered with and how the powder packing acts as a heat insulator. Trico Fuse Mfg. Co.

Item No. 145 **Lighting Booklet**—To help lighting engineers achieve both comfortable seeing conditions and modern lighting effects, this booklet B-3959, 12 pages, describes the new recessed troffer luminaires. Included are photographs of the equipment, sketches, schematic diagrams, illumination design data and suggested layouts for various conditions. The suggested layouts show a group of architectural or functional plans, the proper direction for the installations, and the methods of building up illumination along the edge of a room. Also included is information on how to order the troffers. Westinghouse Electric Corp.

INSTRUMENTS AND CONTROLS

Item No. 146 **Level Indicator**—The outstandng features and the positive action of a level indicator for bins, chutes, hoppers, silos or any material storage is described and illustrated in this 4-page bulletin. It is shown how the level indicator can be connected to any standard light, bell, horn or any type electric signal. McCathron Boiler Works Co.

Item No. 147 **Water Columns and Gages**—Contained in Bulletin WG-1811 is engineering data on this line of water columns and gages. Drawings and text describe the construction details of columns, try-cocks, and gages. The flat glass inserts for water level gages are described and illustrated as are the column and gage arrangements for pressures above 400 lbs. The dimensions and prices are contained in a 2-page spread. A spare or repair parts list is listed and diagrammed. Typical installations are photographed. Yarnell-Waring Co.

Item No. 148 **Operation Recorders**—Bulletin No. 247, 16 pages, contains a factual description of the operation recorder, its design features, methods of installation and applications. Photographs illustrate the material. The types of records are explained and illustrated and the internal wiring is diagrammed. Drawings show how the recorders may be actuated by a great variety of physical and electrical phenomena. The selection of types is fully discussed. Esterline-Angus Co., Inc.

Item No. 149 **Flow Indicators**—For use in water treatment, sewage purification and industrial waste treatment. Applications, principles, operation, and specifications are described in this Bulletin No. 1070-A. Infilco, Inc.

Item No. 150 **Viscosimeter** — For measurement and control of viscosity in a moving stream under full line pressure from 0.0008 to 800,000

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centipoises. These instruments are available in simple indicating form or arranged for continuously recording viscosity values on a 24 hr. chart, or for controlling fluid viscosity by automatic blending or heating. Diagrams and charts show typical installations, construction features, capacities and dimensions of the unit. Bulletin No. 88; Fischer & Porter Co.

Item No. 151 **Chlorine and pH Control**—In addition to descriptions of the various comparators for pH, chlorine and phosphate control for water analysis this 96 page book contains simple and technical discussions of the meaning of pH control, the applications of pH, chlorine and phosphate control to many different industries and precautions which must be observed in making determinations. Control of boiler water treatment is discussed, including pH, phosphate and nitrate, and equipment is recommended for this purpose. W. A. Taylor & Co.

Item No. 152 **Instrument Catalog**—This excellent 48 page instruments catalog No. 110 contains a complete line of industrial thermometers and other instruments. Each instrument is illustrated and well described together with dimensional tables. Bulletin contains such items as dimension drawing of industrial type mercury thermometers, case and drilling dimension drawings for round form recorders, rectangular form recorders and dial thermometers, a Moeller chart showing uniform scale graduations, a fahrenheit chart and centigrade, and reverse reading and reaumur charts. Moeller Instrument Co.

Item No. 153 **Indicating Recorders and Controllers**—For instrument men in scientific laboratories and industrial plants, this catalog ND 44(2), 16 pages, will serve as a handy guide to all the company's round-chart "Micromax" instruments. Included are complete specifications in tabular form for automatic indicating recorders, and indicating and recording controllers. Suggested chart numbers are listed for the more commonly used ranges, together with other accessories and supplies. Included are drawings and photographs to illustrate the text. Leeds & Northrup Co.

Item No. 154 **Instruments**—Bulletin W1811 is a 4 page stock instrument folder containing listings of a number of instruments. The specifications and applications of each unit is described and accompanied by a photograph. Such items as recording pressure gages, thermometers, indicating temperature controllers, indicating pyrometers, and others are described. Bristol Co.

Item No. 155 **Programming Control** — This 4-page Bulletin CD 4751 is a specification and installation sheet on the Type 24PJ8 programming control for commercial and industrial oil and gas burning equipment. The general specifications are listed and described. The installation, together with the location and mounting and wiring, is illustrated with three installation drawings. Photographs show the instrument. Combustion Control Corp.

Item No. 156 **Electrical Measuring Apparatus** —Described in this 8-page Bulletin G-1-A is a line of such electrical measuring apparatus as resistance standards, D-C bridges, potentiometer, resistance boxes, bridge components, kilovoltmeters and ohm resistors. Photographs illustrate the various models. Specifications, applications and price lists are included. Shallcross Mfg. Co.

Item No. 157 **Heating and Air Conditioning Thermometers**—A line of thermometers for every heating and air conditioning application is contained in this 4-page bulletin. Illustrated are a number of the instruments. Shown is a cross section view of the glass, and a table of standard ranges. Other tables give standard specifications of thermometers for pipe lines and standard ranges of thermometers for air ducts and refrigerating rooms. Bulletin closes with a photograph and a description of a dial-indicating and recording thermometer. Moeller Instrument Co.

Item No. 158 **Counting Devices** — Catalog No. 51, 8 pages, illustrates and describes a complete line of counting, timing and recording devices. Photographs show typical installations. All items are fully described along with specifications and prices. A centralized production counting panel, electrically operated, is shown to offer a great opportunity for far reaching improvements in production control efficiency. Other instruments that are described are stroke counters, stroke and revolution counters, electric counters, coil winding counters, predetermined electric counters, etc. Production Instrument Co.

Item No. 159 **Thermometers**—A line of general utility thermometers are listed and illustrated in this 4-page bulletin. The range, tube filling, case and size and price is tabled for each item. Also included are lines of sling psychrometers and outdoor thermometers. Moeller Instrument Co.

Item No. 160 **Damper Control**—Complete engineering data is contained in this 4-page bulletin on damper control. The application and instructions for usage is discussed, as well as the specifications. A photograph helps point out the various features of the model DCR-A. Line drawings show typical installations. The cabinet dimensions are also diagrammed. Cleveland Fuel Equipment Co.

TREATMENTS

Item No. 161 **Oil Conditioner** — This catalog leaflet is devoted to a description of an oil conditioning unit for complete purification of used oil. A photograph illustrates the unit. Included are specifications for various sizes. The operation of the unit is fully discussed. U. S. Hoffman Machinery Corp.

Item No. 162 **Handbook of Water Conditioning** —A 60-page reference Bulletin No. G-1 which has been brought up-to-date to include the most recent developments in the design of water treatment and liquid conditioning equipment. Included in the material are tables listing the various kinds of gaseous and solid impurities, showing the effects, limits of tolerance for various purposes, methods of removal and residual amount of each impurity after treatment. A comparison chart shows the chemical results produced by various water treatment methods. More than three dozen diagrams illustrate the principles of construction and operation of various processes and equipment for softening, clarification and demineralizing of water and other liquids. Liquid Conditioning Corp.

Item No. 163 **Corrosion Resistant Equipment** —Bulletin K, 16 pages, describes a line of corrosion-resistant material and equipment. The bulletin aids the engineer in selecting proper or suitable corrosion-resistant materials and helps him in determining quickly how these materials may best be used for combating corrosion. Materials described include ceramics, duralon, lead and others while the equipment includes tubing, lining materials, protective coatings, mixing equipment and masonry. The bulletin is exceptionally well illustrated and a table of application and qualities of protective coatings is presented. U. S. Stoneware Co.

Item No. 164 **Rust Treatment**—A preparation for the elimination of rust, corrosion and congestion in all hot or cold water systems and in high and low pressure steam plants is described in this 4-page bulletin. Dosage requirements are explained. It is shown how better heat as well as clear water can be made possible through use of this treatment. Specific uses are listed. Dominion Chemical Co., Inc.

Item No. 165 **Fuel Oil Treatment**—Presented in this 4-page bulletin is engineering data on a fuel oil treatment for the prevention and correction of unsatisfactory conditions in the storing, pumping, heating and burning of industrial fuel oil. Shown are two large drawings which help explain when the "Ameroid" fuel oil treatment is and is not used. Also discussed is the problem of sludge and a simple experiment shows how the treatment helps eliminate this nuisance. The application of the treatment is thoroughly explained. E. F. Drew & Co., Inc.

SURFACING

Item No. 166 **Plastic Paint** — This excellent Bulletin 709, 16 pages, contains information on a corrosion resistant plastic paint. Included is a condensed technical data sheet on the paint. A two-page table shows the resistance characteristics of the paint. It is fully explained how the paint can be used as a lining material. Three different colored primers and eight top coats are shown. The surface preparation, the application of the primer and the application of the top coats is thoroughly described. A price list accompanies the bulletin. U. S. Stoneware.

Item No. 167 **Weatherproofing**—This is a 12-page bulletin devoted to a discussion of "lasting protection for metal surfaces." The characteristics of the coating is explained. Seven applications are described. It is shown how the coating lengthens the protection cycle and how it is applied. Arco Co.

Item No. 168 **Leak Stoppage** — How to stop leaks without removing water pressure is described in this 4-page folder. It is shown how this product stops direct leaks instantly, waterproofs concrete, masonry or brick and reshapes spalled areas. Photographs illustrate method of application and typical installations. The shipping units are listed. Flexrock Co.

Item No. 169 **Flooring** — Bulletin No. 603, 4 pages, describes a flooring meant to cut floor maintenance. Photographs show typical installations. Companies that use the flooring are listed. It is explained how it is resistant to processing materials, how it is unaffected by intense heat or cold and how it improves trucking facilities. Walter Maguire Co., Inc.

Item No. 170 **Roof Cement**—A roof cent specifically designed for blizzard protection is described in this 4-page bulletin. It is shown to be a correct liquid and plastic waterproofing compound that can be used on all surfaces. Two drawings show method of application. The covering capacities are listed. Dominion Chemical Co., Inc.

Item No. 171 **Resurfacer**—An 18-hour floor-patch and resurfacer is described in this 4-page folder. Information is given about the uses and advantages of the resurfacer and directions for applying are explained. Four photographs show method of application. Also listed are the shipping units. Flexrock Co.

Item No. 172 **Waterproofing Fabric**—Contained in this Bulletin 3f-10 is valuable information on a new inorganic waterproofing membrane fabric. Photographs show typical applications of the product. The advantages are described, specifications explained and applications detailed. Included in the booklet is information on a utility truck and an aluminum derrick manufactured by the company. The Lexington Supply Co.

Item No. 173 **Surface Protection**—A black protective coating for concrete, masonry and steel is described in this leaflet. It tells how the product, Sika-Seal, adheres to and protects wet or dry surfaces. It gives instructions for use, and includes photographs of typical applications. Sika Chemical Corp.

Item No. 174 **Floor Maintenance**—In this excellent bulletin of 10 pages is information on modern maintenance methods for floors. The various type floors: wood, linoleum, rubber, terrazzo, concrete, asphalt and mastic tile, cork, marble, tile and others are included. It is shown how to condition, finish and polish and to maintain these floors. It is explained how the application of the company's products can be used in these various processes. Included is a description of each product. A. C. Horn Co., Inc.

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Item No. 175 **Surfacing**—This bulletin contains a handy reference chart for maintenance superintendents and engineers indicating principal surfacing products and processes furnished by the company. Included is information for surfacing walls, floors, roofs, walks, roads, fences and equipment. Typical installations using the company's products are illustrated. United Laboratories, Inc.

Item No. 176 **Resurfacer**—A heavy-duty material for repairs and overlays to concrete and wooden floors. This folder lists the characteristics of the material, and describes and illustrates several applications in solving floor problems for various industries. Stonhard Company.

MAGNETIC

Item No. 177 **Magnetic Separation**—Catalog No. 11, 8 pages, first contains a discussion of the function and services of the company magnetic laboratory. The purpose, construction and operation of a magnetic tube tester is then explained, followed by a description of the application, operation and specifications of the wet type separator, induced roll type IR separator and a cross belt type separator. All separators are illustrated, with photographs. The operating principle of the induced roll separator is diagrammed. Dings Magnetic Separator Co.

Item No. 178 **Magnetic Pulley**—This 8-page bulletin describes how tramp iron or other ferrous metal contamination may be automatically removed from materials in process. Engineering data is given to aid in selection of proper units. Principles of design and operation, specifications and tables of capacities, dimensions and weights are included. Photographs illustrate specific application for use of the pulleys. Eriez Mfg. Co.

WELDING

Item No. 179 **Electric Welding Accessories**—Electrode holders, ground clamps, cable connectors and splicers, terminals, lugs and carbon holders are described and illustrated in this 12-page Bulletin No. 1948-T. Quantity price and parts information is included. Tweco Products Co.

Item No. 180 **Welding Fittings**—A line of stainless steel seamless welding fittings is described in Catalog S-309, 52 pages. A visual index shows how to locate the desired type fitting in the catalog. The first section of the catalog illustrates and describes a few of the steps in the making of the fittings. The remainder of the catalog is devoted to such engineering data as line drawings, photographs, and dimensional tables for the various fittings, in addition to a page listing dimensional tolerances of the fittings listed in the catalog and a table giving the standard stainless steel types and range of analyses. Pittsburgh Piping and Equipment Co.

Item No. 181 **Electrode Wall Chart**—This 25 by 35 in. electrode wall chart shows procedures for every type of arc welding electrode; actual results of too long or too short an arc, too much or too little welding heat, too fast or too slow a welding speed and then shows a perfect bead as well as a cross-section of all welds; and complete illustrated welding symbols for both fusion and resistance welding. Hobart Bros. Co.

Item No. 182 **Welding Fittings and Flanges**—This is a 6-page dimensional data booklet, No. 476, for stainless steel welding fittings and flanges. Included are two dimensional data tables and many line drawings. Taylor Forge & Pipe Works.

Item No. 183 **Resistance Welding**—Spot, projection, seam and flash-butt welding is described in this 4-page bulletin. Photographs show typical operations of the various machines. The capacities of the units are stated and a series of pertinent questions and answers is included. Taylor-Winfield Corp.

Item No. 184 **Welding Problems**—The causes and cures for hot-running welding cables and connections are effectively explained in this 2-page Bulletin No. CC-47. Men charged with operating and maintaining welding cables will find many helpful hints in this practical article. Tweco Products Co.

Item No. 185 **Resistance Welder**—Vol. 2—No. 4 is a 4-page bulletin describing the operation of this resistance welder. Photographs show the machine in operation and schematic diagrams explain the principle of the automatic fixture. It is told how only one unskilled man is necessary to run the machine. Three drawings give the necessary tooling data showing minimum dimensions of piece part that can be welded with welder. Sciaky Bros., Inc.

Item No. 186 **Arc Welding Problems**—Vol. 4—No. 8, is an 8-page bulletin which successfully solves a number of arc welding problems. It covers such items as welding cast-iron, low and high alloy steels, stainless steel and tool steels to high carbon steels; welding special manganese parts, elimination of undesirable characteristics and other problems occurring in everyday welding. Twelve production case histories are well presented. Illustration of the various steps are included. Listed are the company's line of welding rods. Eutectic Welding Alloys Corp.

Item No. 187 **Transformer Arc Welders**—Industrial type transformer arc welders, with 300 amp—500 amp capacities, are described and illustrated in this 4-page folder. It is shown how they can be used for production welding to cut costs and how they compare to other a-c welders. A photograph shows a portable mounting. Hobart Bros. Co.

Item No. 188 **Arc Welder**—Contained in this leaflet is a description of a combination battery charger and arc welder. Two models are illustrated: a 30 amp charger with a 75 amp welder and a 10 amp charger with a 55 amp welder power factor corrected. Outstanding features and the specifications are given. Larkin Lectro Products Corp.

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Bulletins . . . . Catalogs

Item No. 189 **Arc Welders**—Catalog EW-123, 36 pages, contains valuable information on a line of arc welders. Photographs show various models and typical applications. The features, such as: multirange control, remote control, stabilization, cool operation, etc., are explained and illustrated. Each model is photographed, described and detailed with specifications. A two-page spread contains a cut-away drawing showing all outstanding design features. Catalog closes with a listing of accessories, various welding books, and electrodes and shows pictures of the company trade school. Hobart Bros. Co.

Item No. 190 **Welding Carbons**—A line of a-c welding carbons, cored and copper plated, are described in this 4-page booklet. It is shown how to achieve better results from these carbons. List prices are included. Speer Carbon Co.

Item No. 191 **Bronze Electrodes**—"Welding with Ampco bronze electrodes," is the title of this new 24-page Bulletin W-17. It contains factual information on how to weld a wide variety of alloys using bronze arc welding electrodes. Detailed information on welding procedures and techniques is given as well as a comprehensive chart listing alloy types, specifications, chemical compositions, physical properties, and weldability values using various bronze electrodes. It catalogues all grades of the company's welding electrodes, and includes photographs of typical applications, diagrams and sketches. Ampco Metal, Inc.

PUMPS, COMPRESSORS

Item No. 192 **Departmental Compressors**—Contained in this one-page leaflet is information on a line of departmental compressors. Photographs show various models. It is explained how these compressors can supply every industrial compressor need. Specifications are given of a-c models, V-belt driven departmental compressors and direct drive (flexible coupling) departmental compressors. Davey Compressor Co.

Item No. 193 **Hand Pumps**—A line of hand pumps is described in this Bulletin No. 3002, 4 pages. Drawings show typical uses, and photographs represent the various type pumps. A cut-away drawing points out the different features. Each pump is fully described with complete specification data. Other pumps with meters are also included in the Bulletin. Bowser, Inc.

Item No. 194 **Centrifugal Pumps**—A line of centrifugal pumps for caustic and acid solutions is presented in this 4-page Bulletin No. D-2400. It is shown how the pumps assure better handling of acids and caustic solutions with less maintenance and fewer replacements. The general specifications are given along with a specification diagram. A parts list is illustrated by a cut-away drawing. Peerless Pump Division, Food Machinery Corp.

Item No. 195 **High Pressure Pumps**—Complete engineering data on this line of high pressure, high volume hydraulic pumps is contained in this 8-page Bulletin P-1. Photographs and drawings illustrate the various models. Included is a typical performance chart, a cross-sectional diagram illustrating the pressure balance principle, installation data, operating characteristics, recommended operating pressures in psi, and discussion of the applications and mountings. Accompanying the description of each model is an explanation of the oil supply, direction of rotation, and drain connections. Bulletin closes with a discussion of the hydraulic oil recommendations for the company's pumps, fluid motors and controls. Denisen Engineering Co.

Item No. 196 **Centrifugal Pumps**—Four and six stage volute centrifugal pumps are described in this 6-page Bulletin 241. Complete engineering data contains cross-sectional drawings of the pumps, metal specifications table, and line drawings with accompanying dimensional table. Typical installations are shown. Warren Steam Pump Co., Inc.

POWER TRANSMISSION

Item No. 197 **Speed Pulleys**—This line of variable speed pulleys is described in Catalog No. 647, 16 pages. The operation of the pulleys is discussed. Nine pages of the catalog are devoted to extensive engineering data. Included are specification drawings, and tables of maximum and minimum driven speeds and belt centers in inches at maximum speed. One table shows how to select proper base for motor rating and frame number. The installation of the pulley and the motor base is explained. The general dimensions of the motor base is also included. Gerbin Mfg. Corp.

Item No. 198 **Chain Belts**—A complete line of chain belts for every industry is contained in this 12-page Bulletin 46-10. Many photographs illustrate typical installations. In addition, there are many other enlarged photographs to show the various type chains the company manufactures. A number of standard attachment links, and sprockets are also shown. Chain Belt Co.

Item No. 199 **Products Catalog**—Bulletin 10000 is a 12-page catalog containing descriptions and illustrations of such items as gears, speed reducers, motor reducers, couplings, high speed drives, backstops, marine drives, and special gear drives. Drawings show the construction features of the line of couplings and how they react under different loads. The services and facilities of the company are explained. Falk Corp.

Item No. 200 **Flexible Couplings.**—A line of flexible couplings is described in this one-page folder. Illustrated are a number of applications of the couplings. A group of drawings represent various type couplings for every speed or hp. There are discussions about why the disc ring is round instead of irregular or octagonal shape and why each disc is laid alternately with the grain of the steel. Also included are a number of line drawings of the couplings. Thomas Flexible Coupling Co.

Item No. 201 **Engineering Manual**—This 92-page ngineering Manual and Catalog No. 114 covers the engineering, application, installation and use of the company's line of speed reducers. Inspection and Tests, Selection of Speed Reducers, Design and Construction, Lubrication and Oil Retention are some of the sections in the booklet. Many full page tables of horsepower and torque output ratings and overhung lad capacities are included. The book is well illustrated with photoes, sketches and blueprint-type drawings. The booklet is plastic-bound in a heavy cover. Winfield H. Smith, Inc.

PIPING

Item No. 202 **Pipe and Fittings**—A line of saran lined steel pipe and fittings is described in this 4-page bulletin. The line is completely diagrammed. Contained is a table of pipe sizes and dimensional drawings. A photograph shows the steel pipe cut back 3/16 in. from the face of the saran liner to provide gasket seal or joint. The steel pipe and fittings are thoroughly discussed in the text. Dow Chemical Co.

Item No. 203 **Clay Pipe**—Contained in this 4-page bulletin is information on a line of clay pipe. Described are such products as sewer and drain pipe, skip pipe, staminite pipe, liner plates, flue lining, etc. There are several diagrams of the various clay items, with specification and dimension tables. Robinson Clay Product Co.

Item No. 204 **Culvert Pipe**—A new vitrified clay skip-pipe for driveaway culverts is described in this leaflet. A photograph shows how it is used and a line drawing gives its specifications. It is presented as being able to lay in a shallower trench. Robinson Clay Product Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between 10 and 11 and 58-59

MISCELLANEOUS

Item No. 205 **Mechanical Leather and Synthetic Rubber**—Described in this excellent 32-page catalog are such products as: flat, round and twist belting, coiled, boxed and safety belt lacing, coupling leathers, mallets, packing, oil seals, pinions, straps and other leather and synthetic rubber products. Included are photographs, price lists and description of the various units. Many diagrams and drawings show how the products can be used. Chicago Rawhide Mfg. Co.

Item No. 206 **Vibration Mounts**—Complete engineering data is contained in this 8-page catalog on a line of vibration mounts. Typical installations are shown. A number of drawings represent the mounts in unloaded, loaded and overloaded positions. It is explained why these mounts offer greater vibration isolation. A graph shows how it is virtually impossible to cause these mounts to "resonate." Specifications are included as are line drawings of the units. Hamilton Kent Mfg. Co.

Item No. 207 **The Consulting Chemist and Your Business**—A 20-page booklet describing the organization, laboratories, services, and scope of Foster D. Snell, Inc., consulting chemists and engineers.

Item No. 208 **Air-Gun**—A leak-proof air-gun for blowing chips, dust, etc., with compressed air is described in this Bulletin 641, 4 pages. Typical installations are shown. An enlarged diagram illustrates the features of the gun. Various models are photographed along with specifications and prices. A line of hose fittings completes the bulletin. Air-Way Pump & Equipment Co.

Item No. 209 **Paper Jogger**—A vibrating paper jogger and vibratory packer is described in this one-page spread. Two photographs show the packer and how to use it. Complete specifications are given. On the reverse side of the leaflet a vibratory fatigue eliminator is presented with photograph of proper usage and a description of the unit. Syntron Co.

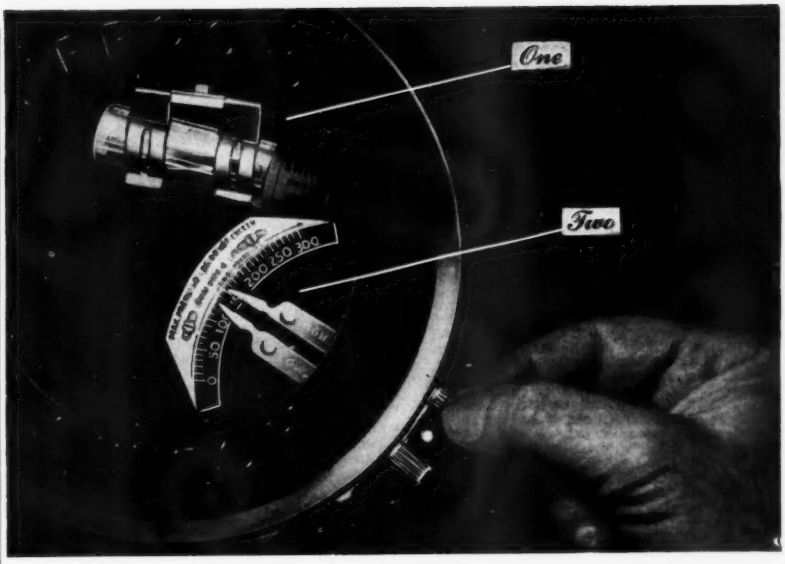
Item No. 210 **Oil Seals**—Complete engineering data is supplied in this 44-page oil seal Catalog No. 947. It is first told what the units do, followed by a discussion of the installation problem, which is illustrated with many drawings. Typical applications of the oil seals are illustrated by a series of 9 drawings. The various types are then illustrated together with a price and dimension tables. Chicago Rawhide Mfg. Co.

Item No. 211 **Metallizing Gun**—The Type 3E metallizing gun for production coatings of zinc, lead, solders, babbitts, cadmium and copper is described and illustrated in this 4-page Bulletin 46 5000/3-46. The speeds by which the various metals can be coated are given. Photographs show typical uses for the gun and results that have been achieved. Also included is a photograph with specifications and stated features. Metallizing Engineering Co., Inc.

Item No. 212 **Crane Bridge Brakes**—Hydraulics as applied to crane bridge brakes is the subject of this No. 14 Bulletin issued by the company. It is shown how each part of hydraulic system is designed specifically for crane bridge brake application. There are discussions of the control cylinder, the remote control bleeder and the actuating cylinder. Drawings show how the control cylinder is mounted in the crane cab, and the type H brake unit, with remote control bleeder mounted close to and slightly above it. Wagner Electric Corp.

Item No. 213 **Hydraulic Cylinders**—Vol. 1—No. 3 is a company magazine containing technical items of interest to anyone using or buying air or hydraulic cylinders. It contains an idea exchange and problem clinic, many photographs of the company's products and interesting cylinder information. Miller Motor Co.

Item No. 214 **Aftercooling**—The benefits, principle and application of aftercooling, and a complete description of a line of aftercoolers are fully covered in this 16-page bulletin. Several pages illustrate the various aftercool-



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One *The exclusive use of non-corrosive mercury switches. They have proven time and again that no other type of contact compares so favorably from the standpoint of trouble-free service or long years of continuous operation—without showing evidences of a breakdown.*

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Engineers readily concede the value of these qualifications, due to the relative functional responsibilities involved in automatic controls

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For Heating, Air Conditioning, Refrigeration and Various Industrial Applications

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ers with cross-sectional views and description of their operation. One spread is devoted to a typical compressor plant set-up, showing a photograph of a complete layout, including compressors, intake filter, piping, aftercooler, receivers, headers and control panel. A selection table for choosing the proper size aftercooler for specific compressor output is also included. Ingersoll-Rand.

Item No. 215 **Air-Diffusers**—In this excellent Bulletin K-20, 32 pages, is described a line of adjustable air diffusers. Included is information on air direction and volume control, many photographs of the units, together with line drawings and a description of the diffuser. The engineering data includes selection and performance information and performance charts, selection and location information, dimensional tables and a description of the standard specifications for diffusers and accessories, assembly and erection, testing and balancing and air direction adjustment and air volume adjustment. W. B. Connor Engineering Corp.

Item No. 216 **Turbo Blowers** — Bulletin No. 300-S, 6 pages, is devoted to a description of this line of turbo blowers. Blower selection is discussed. Photographs show the blower with a v-belt drive, with an oil pump attachment, directly connected and directly coupled. Included are line drawings of the blowers. Shown is an actual performance curve of a typical turbo blower. The various features are detailed on a drawing. Also illustrated is a typical installation. North American Mfg. Co.

Item No. 217 **Oil Filters**—These oil filters for fuel and lubrication of internal combustion engines are described in Bulletin 7B, 4 pages. Included are photographs and drawings of various models, parts, and filtering surfaces. Two drawings illustrate piping all the oil in circulation to and from the filter and piping only the oil that is actually to be filtered to and from the filter. A microscopic photograph shows how the filters remove harmful grit, dust, etc. Wm. W. Nugent & Co., Inc., Mfrs.

Item No. 218 **Moulded Fabric Bearings**—Bulletin HB 542, 4 pages, describes performance qualities produced by special methods of moulding resin-bonded fabrics to the finished shape and size. A chart shows the comparative performance of moulded and machined surfaces, while photographs illustrate these two surfaces. Drawings are also used to illustrate this point: one showing comparative installation clearances, another the effect of misalignment, while a fourth shows the effect of shifting pressures. Gatke Corp.

Item No. 219 **Steam Boiler Unit** — This complete automatic steam boiler unit is described in Bulletin No. 503, 4 pages. Complete specifications and dimensions are listed. Photographs show the boiler from many angles. Discussed are the waterback design, the standard equipment, the boiler and the burner, the operating and safety controls and the special equipment. Johnston Bros., Inc.

Item No. 220 **Heating Coils**—Design and construction features, as well as complete specifications, for the standard, non-freeze, booster, and hot water heating coil are described and well illustrated in this new 48-page Catalog No. 348. Performance tables for steam capacities from 5 to 150 psi, entering air temp from —30 to 80 F, and air velocities from 300 to 1400 ft per min for single and multiple coils; hot water coil capacities; steam capacity curves; air friction tables; and conversion factors for air friction and volume are given. Included in this informative booklet which could serve as a handy reference manual, is a section devoted to an explanation of heating coil selection, piping arrangements, and suggestions for piping and installations. A pipe size table for steam and typical heating coil specifications are also included. Modine Mfg. Co.

COCHRANE ALL-SERVICE

EXHAUST OF LIVE STEAM **SEPARATORS** COMPRESSED AIR

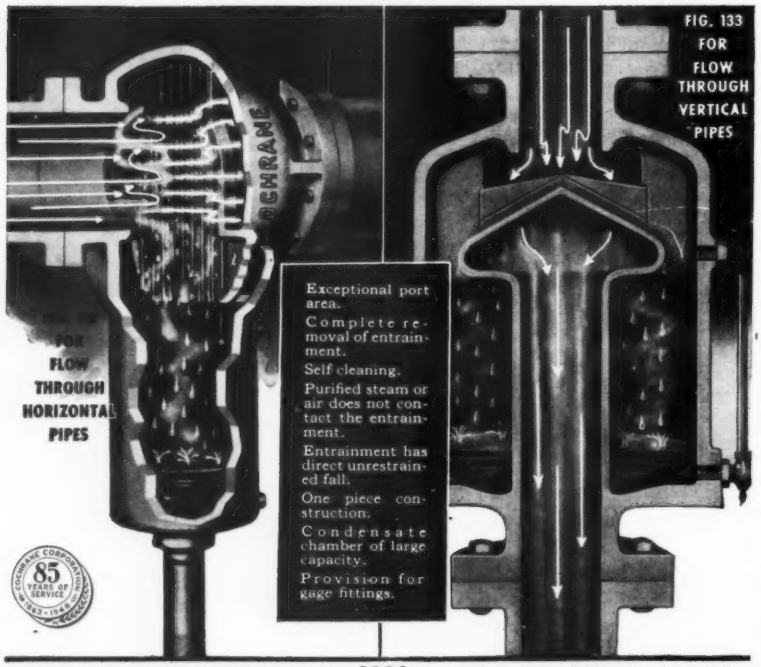
FIG. 133 FOR FLOW THROUGH VERTICAL PIPES
COCHRANE
FOR FLOW THROUGH HORIZONTAL PIPES
Exceptional port area.
Complete removal of entrainment.
Self cleaning.
Purified steam or air does not contact the entrainment.
Entrainment has direct unrestrained fall.
One piece construction.
Condensate chamber of large capacity.
Provision for gage fittings.
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COCHRANE CORPORATION, 3126 N. 17th St., PHILA. 32, PA.

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Item No. 221 **Vaneaxial Blower** — This leaflet contains a group of test code figures to prove the economy of air delivery against pressure afforded by this vaneaxial blower. Figures represent performances of two belt-drive blowers, 18 and 42 in. A typical blower is photographed. Hartzell Propeller Fan Co.

Item No. 222 **Steam Jet Heaters**—This 20-page catalog contains a line of steam jet heaters for liquids. Photographs and text describe the various heaters and sparger nozzles, together with general information on their construction and operation. Tables and drawings give complete data on dimensions, connection sizes, weights of the various types and piping arrangements. Typical applications are diagrammed. Schutte and Koerting Co.

Item No. 223 **Dust Control Units**—A line of self-contained dust control units is described in this 4-page bulletin. Photographs show these units before and after installation of filter cloths. A drawing explains the mechanical operation of the unit. Another line drawing is detailed with specifications. Kirk and Blum Mfg. Co.

Item No. 224 **Sealed Air Chambers** — Water hammer—its cause and cure—is the subject of this 6-page Bulletin 12p. Included are facts about the sources of water hammer, its damage and the way it can be prevented. Selector tables are included to show the correct size sealed air chamber to use in preventing water hammer damage. On the back pages are pressure flow charts showing pipe sizes and pressures necessary for required gpm water flow in buildings, and other authoritative piping information for engineers and plumbers. Wade Mfg. Co.

Item No. 225 **Diaphragm Air Motors** — Series 600 diaphragm air motors is described in this 4-page bulletin. Contained are a number of photographs of the motor with various adjustable port valves. A line drawing gives the specifications of the motors. Four tables include motor valve assembly prices comprising series 600-65 diaphragm motor, adjustable port valves and valve linkages; with and without Moore positioner, bypass, gages and positioner linkage. North American Mfg. Co.

Item No. 226 **Heavy Duty Engines**—Complete engineering data on a line of heavy duty engines is contained in this leaflet. Shown are line drawings and a photograph of the engines. The dimensions and general specifications together with optional equipment are listed. White-Roth Machine Corp.

Item No. 227 **Combustion Unit** — A tandem combustion unit for combined gaseous and oil fuels is described in this supplement 6 to Bulletin No. 50. Shown is a drawing of the unit as part of a system, and two other installation drawings. Also included is a capacity data table and a listing of the utilities required at the burners. National Airoil Burner Co.

Item No. 228 **Ice Cuber**—Bulletin 453, 4 pages, describes the Gifford-Wood Type C automatic ice cuber. Charged with a cake of ice, elevators and automatic control positions and saws the cake and discharges ice cubes through a chute. Gifford-Wood Co.

Item No. 229 **Food Processing Equipment**—Contained in Bulletin No. 47-1, 16 pages, is invaluable information on a line of process equipment for the food industry. It especially embraces the Thermo-Roto, Deaerator and the Juice Line—equipment for modern canning plants processing liquid and semi-liquid food. Typical installations are shown. The operation of the equipment is described and illustrated with cyclic diagrams. Drawings show the dimensions and capacities. The machine sizes are listed. Comparison of cooling methods is dis-

cussed and the deaeration of liquid and semi-liquid food products is explained. A typical tomato-juice flow diagram is included. Chain Belt Co.

Item No. 230 **Air Cylinders**—Bulletin A-105, 10 pages, is replete with engineering data on a line of air cylinders. Full mounting dimensions and installation drawings are presented on 16 models of double acting and single acting cylinders. New copyrighted tables show thrust developed and consumption of cylinders, capacities and pressure losses in pipes and fittings, and piston rod strength. An enlarged drawing shows a cut-away portion of an air cylinder. Miller Motor Co.

Item No. 231 **Speed Reducers**—Typical installations of various models of the company's line of speed reducers are shown in this 8 page bulletin. The bulletin emphasizes the savings that can accrue from using these speed reducers, and shows the relationship between the size of these reducers to that of other models. Cleveland Worm and Gear Co.

Item No. 232 **Paper Cutter**—This one page leaflet includes information on a paper cutter that can be used for hand cutting of single sheet paper such as blueprint, photostats, work drawings and layouts. The various commercial sizes are given and the method of operation is photographed. Hobb Mfg. Co.

Item No. 233 **Rubber Usage**—This brochure cites the advantages and new developments in the use of rubber with shaft rollers and idler sheave fillers. The booklet is illustrated with photographs of installations, engineering tables and formulas, and lists several case histories in the copper and iron mining industry. Goodyear Tire & Rubber Co.

Item No. 234 **Hose**—Bulletin 6893 describes two types of hose especially engineered for uses to which creamery and packers hose is subjected. The bulletin shows the covers which are said to resist the deteriorating effects of animal fats and abrasion. Raybestos-Manhattan, Inc.

Item No. 235 **Gas Systems**—This is a 12-page bulletin devoted to "Infra-Red" gas systems. Why these systems increase the rate of heat transfer; why the systems reduce normal processing time; why the systems reduce fuel consumption, are typical questions that are answered. An excellent cut-away photograph, accompanied by a description, shows how the systems are made and how they function. Other photographs show sizes, shapes, arrangements of various systems and also illustrate typical installations. Three tables show burner capacity that can be varied by either increasing or decreasing baffle setting at a constant manifold pressure or by increasing or decreasing manifold pressure at a constant baffle setting, or by altering the burner capacities with various baffle settings. Burdett Mfg. Co.

Item No. 236 **Motion Pictures**—Bulletin B-3988, 24 pages, contains a description of 16 motion pictures and 12 slide films that the company has made for industrial and civic uses. Most of these motion pictures and slide films are loaned free, but some of the slide films must be bought. Of particular interest to the engineer are four "course" slide films on electrical measuring instruments, electronics at work, radio frequency heating and resistance welding control. Two slide films on "Ten Checks of Electrical Control Maintenance" and "Four Firsts of Motor Maintenance" contain very pertinent information. Westinghouse Electric Corp.

Item No. 237 **Flexible Shaft Machine**—Bulletin No. 43, 4 pages, contains relative data on a new 4-speed gear drive flexible shaft machine. There is a description of how it works. This is followed by information on its special features of 4-speed gear drive and details on its various speeds. There are three photographs of a bench, floor and vertical type machine with complete specifications. The bulletin closes with photographs of the various attachments. N. A. Strand & Co.

Item No. 238 **Die Press**—This bulletin, 4 pages, describes the features of a die press which is now being used in the rubber, filter disc, apparel, printing, seal and label fields. Photographs show the press in operation. Construction details and specifications are also listed. Hobbs Manufacturing Co.

Item No. 239 **Power Press Protection**—This folder of 16 pages contains material for owners (who must pay the cost of compensation) and for safety engineers and maintenance supervisors who are directly responsible for the safety of power press operators. It includes a statement of the general problem, a discussion of press maintenance, feeding methods, safety guards, inspection and supervision, operating personnel, lighting, press room and material handling facilities and housekeeping. It concludes with a description of two types of safety guards. Junkin Safety Appliance Co.

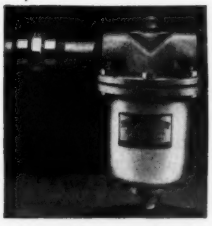
Item No. 240 **Gas Airmixer**—A gas airmixer featuring practical design simplicity, mixture control, and visible operation, is cited in Bulletin 825 of 4 pages. The bulletin tells what the airmixer is, what it does, how it operates, and its applications. A schematic diagram showing how the airmixer functions is included. A listing of the models and capacities concludes the bulletin. Gas Appliance Service, Inc.

Item No. 241 **Metal Hose Handbook**—An exceptionally well put-together handbook on flexible metal hose is Catalog G-47, issued recently. Practically every application for metal hose is covered extensively in the handbook. Many tables of sizes, illustrations of hoses and applications are presented. "Instructions for Hose Installations," is accompanied by bar charts. "Guide to Correct Installation," is a section which gives practical installation hints. Information of this general type follows throughout the 72-page book. Chicago Metal Hose Corp.

FITTINGS ARE SCARCE

SAVE 7 PER TRAP WITH

SUPER-SILVERTOPS

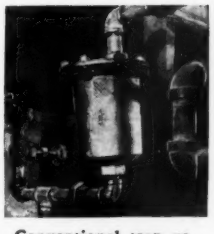


Super-Silvertop showing one nipple and one union needed.

● You might say pipe fittings are as hard to find as "needles in a haystack"—that's why saving them with Super-Silvertop Steam Traps is really important. You save seven to nine fittings with every Super-Silvertop you install. This is possible because you don't need a U-tube of fittings, tailormade for each trap. In Super-Silvertop, the U-tube is built in—included at no extra cost. That saves as much as 60 minutes of installation time per trap as well as scarce fittings.

In Super-Silvertops, you also get the advantage of the alternate elbow connection so handy when your drain line comes vertically down to the trap. And make a note of this—there are no cored passages or split (pierced) gaskets on Super-Silvertop Steam Traps!

If you want a dependable trap that gives trouble-free service for years, and also want to save scarce fittings—investigate Anderson Super-Silvertops. This is a full line of traps, with simplified piping in every size. Complete details in the helpful book, "How To Choose A Steam Trap:" write today for your free copy.



Conventional trap using seven fittings and two unions.

THE V. D. ANDERSON COMPANY

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Plant Engineer's Digest

Longer Thermocouple Life

AT ELEVATED temperatures a good thermocouple tube must: prevent injurious gases from contacting the thermocouple; resist high temperature corrosion; have high mechanical strength; have a low time lag; and a reasonable cost. Combining all of these qualities with steady availability, Inconel protecting tube consisting of 80 per cent nickel, 14 per cent chromium and 6 per cent iron make excellent general purpose tubes for all applications if the sulfurous gas content lies below 1 per cent.

Heat resisting alloys in general are composed of nickel, chromium alloyed with iron and in many cases they are available commercially in cast or wrought form. The density of an alloy increases with its nickel or chromium content and this is further increased by the compressive action of rolling and drawing operations. Results of exhaustive tests made by Brown engineers on various alloys are given in Tables I and II.

In atmospheres found most commonly in industrial heating furnaces, oxidation, reduction, or alternating cycles of oxidization and reduction with or without sulfurous atmospheres are found. As indicated in Table I the 80 per cent nickel, 14 per cent chrome alloy in air does not scale below 2000 F. Resistance to corrosion increases with the amount of nickel present and the 80 per cent nickel alloy is more resistant to this form of corrosion than the others tested.

Since gases containing sulfur compounds are highly corrosive to nickel, this alloy is not recommended where the sulfurous gas content of the atmosphere exceeds 1 per cent. This is one of the few atmospheres which the 80 per cent nickel alloy does not prove superior.

Sagging of a protecting tube mounted horizontally, is highly undesirable. In most steel-jacketed furnaces, a protecting tube which has sagged is extremely difficult to remove for replacement. It may also result in the measurement of a non-representative temperature. The 80 per cent nickel alloy when extended horizontally inside a furnace for 24 in. will not stag below 1800 F.

Any instrument used for controlling and process and which is dependent upon a thermocouple is no more responsive or sensitive to temperature changes than is the primary measuring alloy. The time lag of a protecting tube is therefore important and is determined by several factors such as physical size, weight, specific heat, and the emissivity of its surface.

Test results of time lag made in an electric furnace where the heat transfer was principally by radiation, is shown in Table II. In gas fired or circulating air furnaces the lags indicated would be somewhat less. Due to the increasing rate of heat transfer by radiation at higher operating temperatures, the lag of any protecting tube is inversely related to its operating temperature.

Brown Inst. Co.

RELATIVE RESISTANCE TO HIGH TEMPERATURE CORROSION

Composition			Degrees F. Scaling Temp. in Air (20.9% O_2)	Order of Resistance to Reducing and/or Alternating Atmospheres	Order of Resistance to Sulfurous Atmospheres
% Nickel	% Chrome	% Iron			
80	14	6	2,000	1	4**
60	14	26	1,900	2	3**
32	20	48	1,900	3	2**
None	28	72	1,900	*	1

* Not Recommended for Reducing or Alternating Atmospheres
** Not Recommended Where Sulfur Content of Atmosphere Exceeds 1%

ACTUAL TIME LAG OF #8 GAUGE COUPLES AND PROTECTING TUBES IN ELECTRIC FURNACE

Composition			Tube Dimensions (Inches)			Tube Weight (#/Ft.)	Lag in Minutes	
% Nickel	% Chrome	% Iron	I.D.	O.D.	Wall		1,600° F.	1,300° F.
80	14	6	.622	.840	.109	.93	.586	.968
None	28	72	.875	1.125	.125	1.24	.700	.959
60	14	26	.687	1.125	.219	2.22	.714	.983
32	20	48	.813	1.312	.250	2.67	.834	1.292

Maintenance of Temperature Indicating and Recording Instruments

METER CONTROL coverage in steel industrial units has made rapid advancement only during the past decade.

In the work of the department at the Gary Sheet and Tin Mill, we are constantly finding new and highly practical applications for instrumentation

Major shop activities consist of rebuilding, repair and servicing of relays, motors, meters, and such instrument units as may require recalibrating, range changing, etc., not feasible in the field.

Each shipment of thermo-couple wire received at Gary Sheet and Tin Mill, irrespective of its intended application, is routed directly to the shop for standard accuracy analysis.

As another major responsibility of this shop, the maintenance and calibrating of optical pyrometer units is accomplished with the aid of a check set embodying a 0.001 standard shunt and flat filament lamp, furnished and recalibrated at regular intervals by the United States Steel Corporation Research Laboratory. A system of stated interval checking of all optical units is in operation. Calibration and adjustment of radiation tubes is also accomplished at regular intervals.

For instrumentation service, the operating divisions are grouped into five sections, with one or two service men in each, depending upon its size, amount of equipment, etc. Daily, the service man first makes a complete inspection of all equipment under his supervision, during which time he replaces charts, inks, pens, standardizes instruments, etc. He also notes items requiring further attention and returns to them upon completion of the inspection, or notifies the instrument foreman who, in turn, assigns the work to the shop men. These men determine whether or not the equipment can be serviced in the field or must be returned to the shop. If the latter is decided upon, they must set up temporary controls in order that the process work will not be interrupted. The service man is responsible for the entire control installation, from primary element to the final control valve. Twenty-four hour a day instrument service, seven days a week, is available to any division.

—H. C. Morrow,

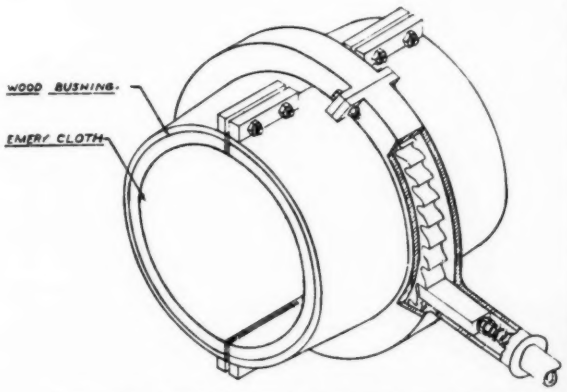
Carnegie-Illinois Steel Corp. Paper presented before Association of Iron and Steel Engineers, Chicago, Ill.

Reconditioning Shafts on the Job

FOR POLISHING and cleaning scored or roughened journal surfaces of large shafts, the tool shown in the illustration can be used effectively. This is a steel cylinder, fabricated in halves so that it may be assembled on a shaft by means of clamp bolts. The inner surface of the cylinder or barrel is lined with emery cloth cut to sufficient length to extend into the clamp surfaces and be held by the bolts.

The cloth should be firmly and uniformly pressed against the shaft. It is advisable to insert a wooden bushing or other slightly resilient material between the steel barrel and the emery cloth. This allowance should be made when fabricating the cylinder.

Operation consists of rotating the emery cloth lined barrel continuously around the shaft journal in a spiral course until the full length of the journal has been cov-



Construction details of a hand driven staff journal polisher

ered. The treatment is repeated in the reverse direction as many times as necessary. Lubricating oil should be poured continuously upon the shaft to remove the loose gritty material. The oil may be collected in the sump for reuse without waste.

Satisfactory results are obtained with No. 1 grade emery cloth. Extreme care must be taken in the matter of cleanliness to prevent foreign matter, especially lint, from lodging on the cloth surface.

While electric or pneumatic power would be more satisfactory, the ratchet and lever device shown in the sketch has been successfully used on jobs ranging from 10 to 24 in. in diam and from 48 to 72 in. in length for rotors weighing from 50 to 200 t. *From* COIL TALK, *a publication of the National Electric Coil Co., Columbus, O.*

Package Steam Boiler Maintenance

PACKAGED STEAM generators applies to units of relatively small size, either fire tube or water tube design, and completely self-contained with boiler, burner, feed pump and automatic controls mounted on a single base. They are, almost without exception, designed to burn oil or gas. The units are usually delivered completely assembled and can be installed with a minimum of field construction, only steam, water, fuel and electrical connections being necessary.

Many reasons contribute to the popular reception accorded these boilers. They are automatically fired, of compact design to fit into a limited space with low head room and, in general, a unit of larger capacity can be fitted into the space occupied by an older type boiler.

Because the packaged units utilize either forced or induced draft with the proper amount of air for combustion controlled at the burners, large or high natural draft stacks are not necessary, and only small diameter

When you have a problem requiring dependable regulation of water temperatures, consider the following advantages when you call Powers:

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Expansion and contraction of metals during *Off* and *On* periods compress links. This fluctuation causes loose contacts and oxidization in other fuses, which finally result in excessive heating and unnecessary blows. WARE HI-LAG construction keeps contacts permanently tight, thus insuring low resistance and longer fuse life.

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vents extending above the roof level are necessary to carry off the products of combustion.

Such units are meeting a demand that has existed for some time. Two points are of paramount significance, however: Every packaged steam generator must be kept clean and free of scale the same as any other boiler; and, because packaged steam generators are dependent upon mechanical and electrical control devices, such auxiliaries must receive careful, periodic attention and maintenance.

With the exception of the forced circulation coil water tube type boiler, all other packaged steam generators are designed to be operated and protected by automatic controls that depend upon the water level in the boiler for their functioning. It is of the utmost importance that these controls be kept in proper operating condition. The controls may be one of several different kinds such as the electrode type, float-controlled mercoid type, float-controlled open contact type, or, the float-controlled permanent magnet-actuated type.

Test Procedure

It is necessary that control equipment be tested frequently, properly maintained at all times and completely overhauled at sufficiently frequent intervals so that it will be kept in proper operating condition.

For any testing procedure to be entirely effective, it is necessary that the tests be performed so that the control will operate in as nearly the normal operating manner as possible. The test should simulate the gradual lowering to the water level as it would occur in the event of a developing low water condition. Such a test could disclose any binding or other condition that might prevent the proper operation of the control.

Float-actuated controls that maintain a proper water level and operate between the high and low level limits of the control day after day will frequently have a tendency to bind when required to go beyond their normal operating limits.

Some responsible person in each plant should understand the detailed functioning of the controls as well as the proper method of testing them, and should be well acquainted with the various pivots, shafts, and parts that may bind or give trouble.

This is necessary so that the equipment may be dismantled, parts examined, and necessary corrections made at regular intervals, to prevent the equipment from failing to function when called upon to protect the boiler in the event of any emergency condition.

Frequency of Test

While there is little information at present on which to base suggestions for a minimum procedure for the testing, maintaining and overhauling of control devices, it is the Company's opinion that the controls should be tested by blowing out the water column of float bowl in which the cut-off is installed at least twice daily, or, once each shift if operated more than one shift.

The bowl and moving parts of the controls should be checked at least monthly for any indications of accumulated sludge or for binding or loose connections. The length of time between cleanouts of the float bowl may be extended where the water condition is such that sludge formation is extremely slow.

Electrical connections on the controls should also be examined regularly. There is always the possibility that a connection may work loose or that contact points may burn and oxidize so that the control cannot perform their functions properly.

By way of comparison, it is relatively common practice for the fuel burning controls used with oil burners to be thoroughly overhauled at least annually. It is even more important from the standpoint of preventing serious damage or destruction to the boiler that the feed water controls and cut-offs be given the same attention. *W. B. Parker in* THE LOCOMOTIVE, *a publication of The Hartford Steam Boiler Inspection & Insurance Co., Hartford, Connecticut, October 1947.*

Precast Ditch Linings

IN THE NORTHWEST, precast concrete blocks have been successfully used for low cost canal lining. Two sizes are being tried: a 8 by 24 by 2 in. block, designed by the Portland Cement Association; and a 24 in. by 24 in. by 2 in. block designed by the Bureau of Reclamations. A 2½ in. thick block of the larger size is also used for the canal bottom.

The mix for all sizes of blocks is made from one part of cement, two and a half parts of sand and three and a half parts of gravel. The block is made in demountable steel form nd removed while the concrete is green. The blocks were hand finished with a steel trowel and cured with Hunt clear curing compound.

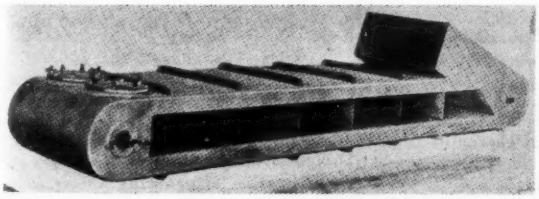
Demonstrating the interlocking features of the 8 in. by 2 ft size blocks. A mastic used must be applied with a hand trowel. Canals and ditches lined with these blocks have proved effective in presenting a firm surface, resistance to weed damage and erosion

In practice the canal is shaped by hand tamping immediately ahead of the crew placing the blocks. The blocks are laid with an internal setup mastic consisting of 8 per cent fibered asbestos, 4 per cent diacomaceous earth, 45 per cent dry asbestos, 35 per cent liquid asphalt and 8 per cent impregnator D. This mastic has very desirable characteristics but must be applied to the interlocking edges of the blocks with a hand trowel.

The large blocks weigh between 100 and 150 lb each and the smaller blocks 34 lb. On curved sections of the canal, a gunite lining is used in order to avoid the use of special shaped blocks. *Van E. Nutley in* THE RECLAMATION ERA, *published by the U. S. Bureau of Reclamation.*

Modern Copper Alloys

ACCORDING to tradition, ancient Egyptians knew how to harden copper and this supposedly is a lost art. Practically, modern copper alloys are available far beyond the dreams of the ancient Egyptians. A few of the alloys which have been developed to meet specific requirements



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are listed below: Five per cent aluminum bronze offers excellent corrosion resistance to impingement attack from sea water and is used extensively as condenser and heat exchanger tubes.

Beryllium copper is one of the most unusual of the alloy groups because of its excellent properties. It, through heat treatment and with precipitation hardening, can be given high strength. It has high endurance or fatigue value, high strength, and good conductivity which makes it excellent for electrical spring contacts and similar uses.

Cadmium copper possesses a fairly high strength coupled with high conductivity and resistance to corrosion. It is used primarily for trolley wire.

Free-cutting phosphor bronze has excellent machinability coupled with high strength and good bearing qualities. It is particularly well suited for bushings, bearings and thrust washers. It also has high corrosion resistance and good fatigue strength.

Free-cutting nickel phosphide bronze is used extensively for forgings and screw machine parts because it possesses high strength and heat treatability. It is used where extensive machining coupled with corrosion resistance is required.

Leaded nickel silver, 12 per cent, provides free machining characteristics in nickel silver and is used where a white colored metal having high strength and machinability is required. It also has excellent cold working properties.

Silicon aluminum bronze possesses high strength, free machinability and ease of hot forging. It has a high resistance to corrosion and fatigue and is about 10 per cent lighter in weight than silicon bronze.

Tellurium copper retains to a large extent the high conductivity and similar properties of copper and at the same time provides improved machinability. *From the* COPPER AND BRASS BULLETIN, *a publication of the Copper & Brass Research Association, New York, N. Y.*

Bolt Tension from Torque Values

TORQUE MEASUREMENTS can be used to give a fair approximation of the applied load whereas in many bolt applications it is important that a definite initial tension or clamping force be developed. This is useful particularly where fatigue is a problem, where leakage under fluid pressure is to be avoided, or, in constructional applications where slippage of the joint would be undesirable.

There are several ways of determining the bolt tension developed in torquing. The simplest, though not the most precise method, is to estimate the tension from the amount of torque as applied with a torque wrench by workman.

Results of the tests indicate that: it is practical to control bolt tension by control of the nut torque; the tension developed can be predicted from the applied torque; and the accuracy of this prediction is within practical useable limits for many applications.

Test samples of bolts and nuts were taken at random from stocks of several manufacturers. Bolts had a yield point of 60,000 psi or higher, and nuts were of the commercial hexagon nuts of American standard regular dimensions, semi-finished to produce a circular washer on the bearing surface. No lubrication was used other than residual coating incidental to the process of manufacture. Other conditions, such as general types of plating and/or lubrication may give widely varied results.

Tests were performed in the standard tension testing machine with a special fixture. This fixture was arranged so that the bolt when assembled on it and tightened exerted a force on the testing machine. This force was measured on the machine dial.

Data indicate that the approximate easily remembered formula for torque can be stated as—

$$T = 0.2 \times D \times L$$

in which T is the torque in lb-in., D is the bolt size in

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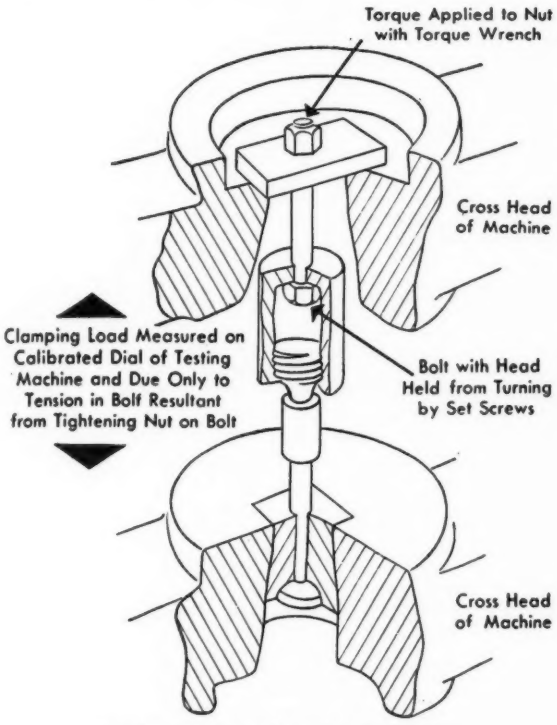
KLIPFEL MANUFACTURING CO. HAMILTON, OHIO

inches, and L the bolt load in pounds. Torque tension relation is not precise and is approximate. If high precision is required in the determination of bolt tension other means must be used for the measurement of


Torque Applied to Nut with Torque Wrench
Cross Head of Machine
Clamping Load Measured on Calibrated Dial of Testing Machine and Due Only to Tension in Bolt Resultant from Tightening Nut on Bolt
Bolt with Head Held from Turning by Set Screws
Cross Head of Machine

Details of the methods used in loading the bolt in the tests discussed

torque. *G. A. Maney, in* FASTENERS, *a publication of the American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland, Ohio.*

Weed Control

RECENT STRIDES in chemical weed control research have shown that weeds no longer need be regarded as a necessary nuisance. Burning units have been used with some success but this requires successive operations, carefully controlled schedules, and of course involves fire hazards.

Oil spraying has been successful when applied in sufficient quantities to cover the vegetation. It has been used in the southwest to control Johnson grass and noxious broad leaved plants and yet not seriously retard the growth and spread of the lower growing Bermuda grass. On the larger scale operation in Arizona approximately 25 gallons per 1000 sq ft was used at a cost approximating $21.00.

Cost of Diesel oil has increased, however, and refining practice is removing more of the aromatic compounds, the fractions that are most toxic to the plants. An investigation has been conducted with some success using a mixture of fortified oils and waters in the proportion of 70 gal of water, 30 gal of oil and 1 qt of phenol fortifier (Dow general, Sinox general, or Chipman General).

Initial tests indicate this non-selective spray will destroy rapidly the parts of the plants above ground. Regrowth will be slower and have less vigor than weeds sprayed with straight, undiluted oil. In addition to being more toxic, the fortified oil and water mix is less than one half as expensive as the 27 deg gravity oil formerly used. Test applications of high aromatic unsaturated oil compounds such as Shell weed killer no. 20 and Stand-

which "Megger"* testing instrument will solve your resistance measurement problem?

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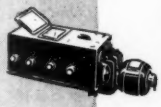

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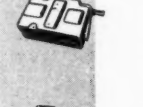

GROUND RESISTANCE—There's the *"Megger" Ground Tester* for measuring resistance to earth of ground connections, such as generating stations, substations, transmission towers, lightning arrester grounds, etc. Also for earth resistivity and special ground resistance measurements in studies of inductive coordination, in electrical protection of pipe lines and in geophysical prospecting.

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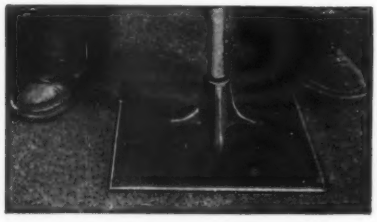

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ard weed killer no. 2 have proved highly successful on Johnson grass and Carrizo cane.

Heavier growths of the shrubby species such as arrow weeds, salt cedars and willows have been handled successfully by burning on the large scale in the Imperial Irrigation District at an average cost per mile of somewhat less than $11.00. On some of the large canals the banks were of such a height that a 45 ft boom on a truck mounted burner could not reach the water line. A special unit mounted upon an amphibious DUKW 2½ t GMC vehicle has been used very effectively.

Trials last year indicated that 2,4-Dichlorophenoxyacetic acid was successful in the control of shrubby, broad leaved plants. The results of further tests this year have been entirely satisfactory. Care and caution are exercised when applying 2,4 D to ditch bank weeds and the practice is followed of not spraying in areas where possible harmful effects to susceptible crops such as cotton and tomatoes would result.

Cost of the 2,4D application compare favorably with the cost of burning. Furthermore, spraying is preferable in that workmen are not exposed to the uncomfortable heat and smoke nor is there a fire hazard. The chemical eradicates the weeds in a comparatively short time while burning requires several operations over a period of years to effect a successful kill. The grassy weeds, however, are not effected by the 2,4 D solution. For these plants, frequent burning or the use of fortified and aromatic unsaturated oils and herbicides must be used. *Curtis Bowser in* THE RECLAMATION ERA, *a publication of the U. S. Bureau of Reclamation.*

Electric Furnace Copper Brazing

IN 1945 the Technical Metal Processing, Inc., was organized to provide the Cleveland area with a source for commercial controlled atmosphere electric furnace copper brazing, bright annealing, and electric induction heating operations. For copper brazing purposes two 50 kw furnaces are installed capable of reaching temperatures up to 2100 F. A third furnace will soon be installed.

Other joining methods frequently cost many times more than electrical brazing. For example, an operator using conventional equipment may spend 2 min making a joint and still has 39 joints left to make. We take all 40 of these assemblies and put them in a heat-resisting alloy tray, place copper at the joints, push the tray into a controlled atmosphere furnace and 8 min later all 40 parts will be brazed and in the cooling chamber.

This cooling chamber is an integral part of the furnace casing and is provided with a water jacket under thermostatic control. Brazed parts move into the chamber and cool rapidly in a protective gas atmosphere until they will not oxidize when brought into the air.

Combined with the economy is the high strength of the joint and the complete absence of porosity. Freon, one of the most difficult gases to hold is contained successfully in millions of Aerosol bombs which were fabricated by copper brazing.

Assemblies come from the furnace chemically clean and silvery white. Joints are consistently smooth and uniform without rough spots or waves.

The same furnaces are ideally suited to bright, scale-free annealing and furnace silver soldering.

Bright annealing, applied to both ferrous and non-ferrous metals, restores softness and ductility to parts hardened by cold working or rapid cooling. It has found ready acceptance in stamping plants and other applications because it eliminates pickling, maintains full metal thickness, and reduces tool and die wear.

Furnace silver soldering is indicated chiefly for production of assemblies involving one or more non-ferrous components or for ferrous material, such as stainless steel, not readily copper brazed. While usually somewhat more expensive than copper brazing, furnace silver

soldering nevertheless has an important and constantly expanding position in modern metal joining. The average silver soldered joint can be completed in 5 to 6 sec. In one specifice example, 12 sec. was required to silver solder two screw machine parts to a tube. The best previous production rate was one assembly in 2 min.

Other equipment includes high and low frequency electrical induction machines and a 15-kw electronic induction heater. These four machines running 24 hr. a day, 6 d a week, use 52,000 kwh monthly. *By Frank Humberger, Technical Metal Processing, Inc., Cleveland, O., in the October 1947 issue of* LOAD, *a publication of the General Electric Co.*

Plant Engineer's Library

Metal Finishing

Metal Finishing Buyers Directory, published by Metal Industry Publishing Co., Inc., 11 *West 42nd St., New York* 18, *N. Y.;* 436 *pages; price,* $1.50 *per copy.*

This book is divided into eight main sections in the guidebook portion and these sections are followed by the product classification directory and Trade Names. For ease in reference the various sections are separated by heavy paper dividers with tabbed edges.

The handbook text has been prepared by various authorities in the field and, in general, is written in terms as non-technical and easy to follow as would be any subject which requires such a vast background of knowledge of materials and methods. The first section on Abrasive Methods for instance, first discusses in considerable detail the makeup of various types of polishing wheels and then launches into a discussion of the types of abrasives used to fasten the abrasive grains to the wheel. Types of abrasives, lubrication of cutting wheels, speeds, abrasive belts, paste wheels and flexible polishing, brushing, buffing and many other subheads follow.

The titles of the eight sections in the front of the book are: Abrasive Methods, Cleaning and Pickling, Electroplating Solutions, Surface Treatments, Control and Testing, Chemical Tables, Organic Finishes and Organic Finishing Methods and Equipment.

Controls Principles and Applications

Instrument and Control Manual for Operating Engineers, by Eugene W. F. Feller, first edition, published by McGraw-Hill Book Co., Inc., N. Y., N. Y., 1947, 413 *pages, price* $6.00.

This is a book for the operator on the job for quick reference when needed. It explains the basic principles of control and operation of liquid level, pressure, temperature, speed, and humidity indicators and controllers. Feller then goes on to explain how the units of a control system are connected together to present, in effect, one unit of operation, and then tells how each unit affects the operation of the others.

The operating elements and fundamental principles of each type of control are explained and illustrated so that the operator may follow them quickly while on the job. Many of the principles of pressure and heat and liquid flow are presented for a quick review of physics. Photographs and cutaway drawings are shown so that practically all the working parts of the control devices are shown clearly. In the appendix a list of standard and non-standard automatic-control terms are given so that

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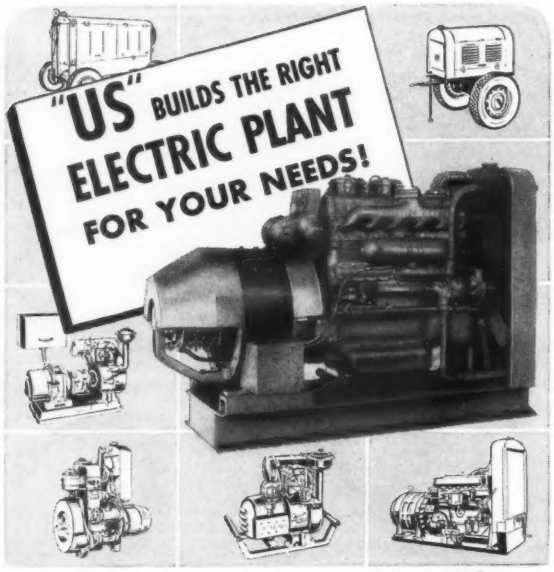

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a uniform set of terms may be set up to aid in better understanding when speaking or writing of automatic-control and its operation. The author of this book has been, himself, an operating engineer and as such knows what the man on the operating floor wants to know. This book will apply to any place that has any type of automatic control at all, be it simple or complex. This applies to industrial as well as power plant controls.

Plumbing Advice

How to Design and Install Plumbing, by A. J. Matthias, Jr., 5½ by 8½ in., published by the American Technical Society, Chicago, Ill., 1947, 435 *pages, price* $3.50.

The author of this book is a licensed master plumber in Milwaukee, Wis., and as such knows what he is writing about. While he spends a good deal of space on domestic and commercial plumbing, he also devotes much practical discussion to plumbing in industry. He takes up the cross connections that can be harmful to health in industrial plants where two sources of water are used. Flashing on the roof for the vents, hanging pipe of various kinds, multiple connections to a common line, traps used on urinals, basins and sinks, are shown and the best use for each discussed. The author expends much space to siphonage from contaminated sources to the drinking water with many sketches to illustrate clearly what he means. Soil, waste, and vent pipe installations are shown for application in different cases. Testing of the water supply system, the vent, waste, and storm systems, are treated practically. He presents in practical terms the way to figure all the problems that come up in connection with laying out plumbing system and figuring the amount of pipe and fittings that will be necessary to do the job according to health standards.

The use of purifiers, both mechanical and chemical is gone into deep enough for general knowledge and use without becoming too involved. Fire line installations are discussed with the average fire code in mind. Quite a bit of space is spent in showing and discussing all the various types of plumbing fixtures without getting into the special fixtures. As he goes from one to the other he tells how each should be connected to hot and cold water supply, vented, and the waste carried away. For practical use in figuring the amount of space needed for different fixtures he presents dimensional sheets.

He discusses industrial waste and disposal of it through treating plants of small size, following it through the various stages and showing what happens to it as it progresses. The book is well illustrated with well chosen photographs and drawings and with many tables to help the plumber or handy man in figuring all lengths and sizes of pipe and fittings. In the back Mr. Matthias gives a list of questions pertaining to plumbing in general and to chapters in the book.

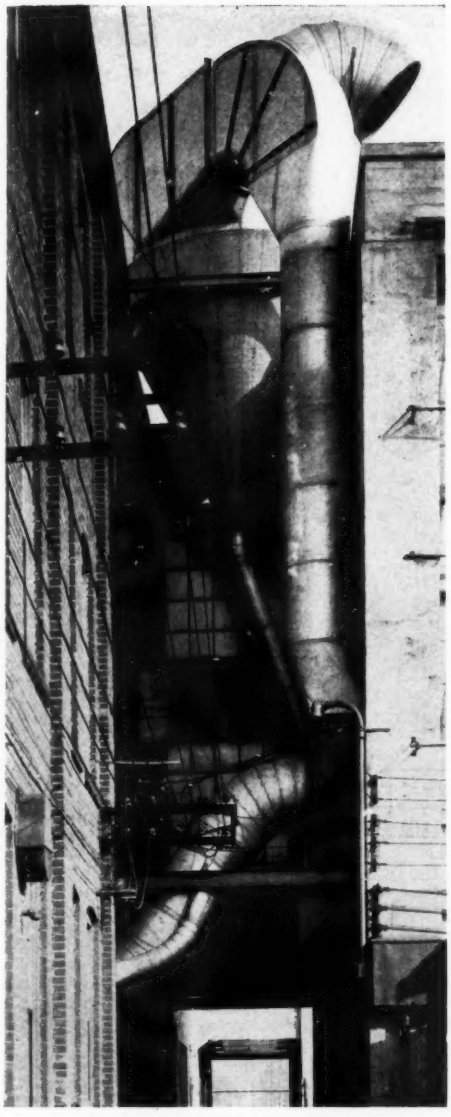
Conference Pointers

Handbook for Discussion Leaders by J. Jeffery Auer and Henry Lee Ewbank; 113 *pages, size* 5 *by* 8 *inches; cloth binding; published by Harper and Brothers,* 49 *East* 33*rd St., New York City; price* $1.75.

Americans always like to talk things over. Whenever a decision must be made or an opinion formed, Americans talk about it. That is the way democracy works in America, the authors point out. It is not always speedy and sometimes it is inefficient. But we haven't nurtured cracker-barrel democracy in America because it is the easiest method; we adopted it and fought for it because it is the freest and best method of self-government.

Recent engineering meetings in which various discussion techniques have been used have aroused much interest and in some cases have been very effective in bringing out points on all sides of a given technical subject.

Discussion takes many different forms such as informal group discussion, committee meetings, conferences, forums, panel forums, symposium forums, lecture forums and debate forums.



*Installation at The Hobart Manufacturing Co., Troy, Ohio

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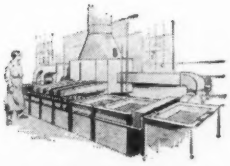

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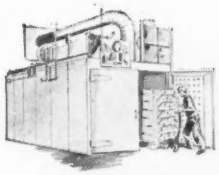

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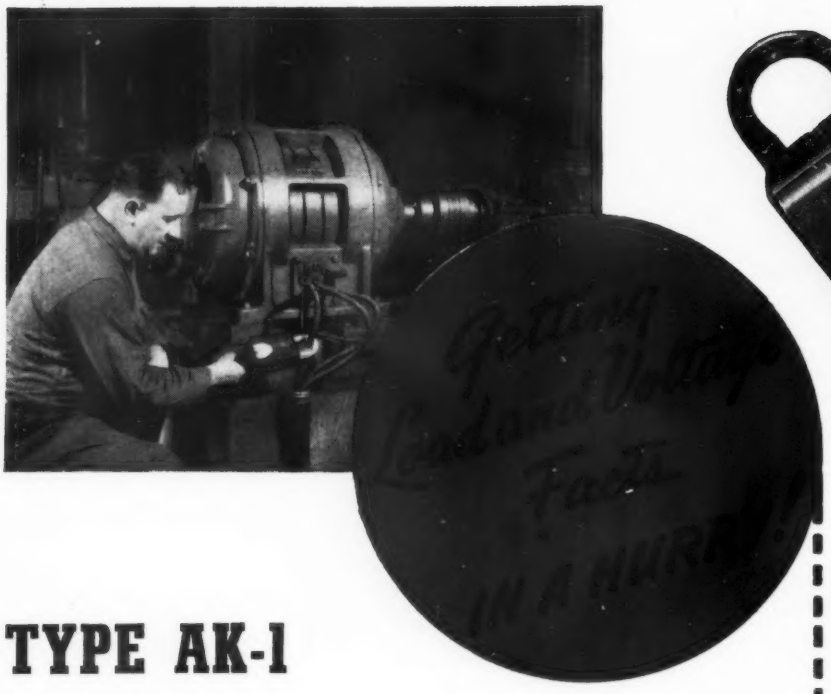

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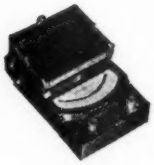

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